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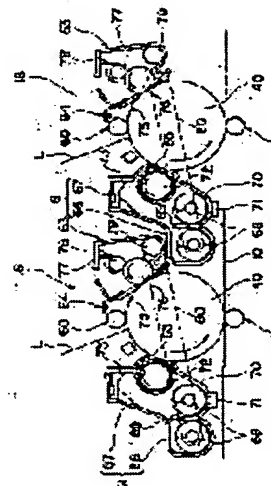
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**(54) IMAGE FORMING DEVICE, MONOCHROMATIC IMAGE FORMING MEANS LOADED TO THE SAME, AND TONER RECYCLING DEVICE LOADED TO THE SAME**

(57)Abstract:

PROBLEM TO BE SOLVED: To enable individually recycling toner while preventing the deterioration of image quality by preventing foreign matter from being mixed into the recycled toner, as for an image forming device.

SOLUTION: A monochromatic image forming means 18 is constituted by providing a developing device 61 and an image carrier cleaning device 63, etc., around an image carrier 40. A tandem image forming device is constituted by horizontally arranging several monochromatic image forming means along the rotary-carrying direction of a belt type intermediate transfer body 10, and a synthesized toner image is formed on the intermediate transfer body in the tandem image forming device, then, the synthesized toner image is transferred to a transfer material, then, a multicolor image is recorded on the transfer material. A toner recycling device 80 for carrying the toner recovered by the image carrier cleaning device 63 to the developing device 61 is separately installed in at least two of the monochromatic image forming means constituting the tandem image forming device.



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CLAIMS

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## [Claim(s)]

[Claim 1] In preparation for the surroundings of image support, a monochrome imaging means is constituted for a developer and image support cleaning equipment. In the image formation equipment which once imprints the toner image formed on the image support of the monochrome imaging means on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material Two or more said monochrome imaging means are put in order along the revolution conveyance direction of said medium imprint object. The tandem imaging equipment which forms a multi-colored picture image on said medium imprint object is constituted. Image formation equipment which comes to prepare for at least two monochrome imaging means the toner recycle equipment which conveys the toner collected with said image support cleaning equipment to said developer among said monochrome imaging means to constitute the tandem imaging equipment.

[Claim 2] Image formation equipment according to claim 1 which compounds the monochrome image formed with said each monochrome imaging means through said medium imprint object, and comes to form a synthetic color picture on imprint material.

[Claim 3] Image formation equipment according to claim 2 which comes to prepare said toner recycle equipment for a monochrome imaging means to arrange in the revolution conveyance direction maximum upstream location of said medium imprint object, with said tandem imaging equipment.

[Claim 4] Image formation equipment according to claim 2 which comes to prepare said toner recycle equipment for a black monochrome imaging means at least among said two or more monochrome imaging means.

[Claim 5] Image formation equipment according to claim 2 which comes to arrange a black monochrome imaging means with said tandem imaging equipment in the revolution conveyance direction lowest style location of said medium imprint object.

[Claim 6] Image formation equipment according to claim 1 which puts in order and establishes said two monochrome imaging means along the revolution conveyance direction of said medium imprint object, compounds the monochrome image formed with those monochrome imaging means through said medium imprint object, and comes to form 2 color images in imprint material.

[Claim 7] Claim 1 said whose image support is a drum and said whose medium imprint object is a belt thru/or image formation equipment given in any 1 of 6.

[Claim 8] Claim 1 both said image support and said whose medium imprint object are belts thru/or image formation equipment given in any 1 of 6.

[Claim 9] Claim 1 which comes to constitute the process cartridge which prepares said image support at least, bundles up to the body of image formation equipment, and is detached and attached thru/or image formation equipment given in any 1 of 6.

[Claim 10] A developer and image support cleaning equipment are constituted in preparation for the surroundings of image support. In the monochrome imaging means of the image formation equipment which once imprints the toner image formed on the image support on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material Among those which put more than one in order along the revolution conveyance direction

of said medium imprint object, constitute the tandem imaging equipment which forms a multi-colored picture image on said medium imprint object, and constitute the tandem imaging equipment, to at least two things The monochrome imaging means of the image formation equipment which comes to have toner recycle equipment which conveys the toner collected with said image support cleaning equipment to said developer.

[Claim 11] In preparation for the surroundings of image support, a monochrome imaging means is constituted for a developer and image support cleaning equipment. In the toner recycle equipment of the image formation equipment which once imprints the toner image formed on the image support of the monochrome imaging means on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material Two or more said monochrome imaging means are put in order along the revolution conveyance direction of said medium imprint object. The tandem imaging equipment which forms a multi-colored picture image on said medium imprint object is constituted. Toner recycle equipment of the image formation equipment which comes to convey the toner which equipped at least two monochrome imaging means with among said monochrome imaging means to constitute the tandem imaging equipment, and which were collected with said image support cleaning equipment to said developer.

[Claim 12] In preparation for the surroundings of image support, a monochrome imaging means is constituted for a developer and image support cleaning equipment. In the image formation equipment which once imprints the toner image formed on the image support of the monochrome imaging means on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material Image formation equipment which establishes one monochrome imaging means to form a monochrome image, on the medium imprint object, and comes to prepare for the surroundings of said medium imprint object the toner recycle equipment which conveys the toner collected with said image support cleaning equipment at the monochrome imaging means to said developer.

[Claim 13] Image formation equipment according to claim 12 said whose image support is a drum and said whose medium imprint object is a belt or a drum.

[Claim 14] Image formation equipment according to claim 12 said whose image support is a belt and said whose medium imprint object is a belt or a drum.

[Claim 15] Image formation equipment according to claim 12 which comes to constitute the process cartridge which prepares said image support at least, bundles up to the body of image formation equipment, and is detached and attached.

[Claim 16] A developer and image support cleaning equipment are constituted in preparation for the surroundings of image support. In the monochrome imaging means of the image formation equipment which once imprints the toner image formed on the image support on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material The monochrome imaging means of the image formation equipment which comes to have toner recycle equipment which conveys the toner which prepared in the surroundings of said medium imprint object, formed the monochrome image on the medium imprint object, and were collected with said image support cleaning equipment to said developer.

[Claim 17] In preparation for the surroundings of image support, a monochrome imaging means is constituted for a developer and image support cleaning equipment. In the toner recycle equipment of the image formation equipment which once imprints the toner image formed on the image support of the monochrome imaging means on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material Toner recycle equipment of the image formation equipment which comes to convey the toner which established one monochrome imaging means to form a monochrome image, on the medium imprint object, and equipped the monochrome imaging means with, and which were collected with said image support cleaning equipment around said medium imprint object to said developer.

[Claim 18] Image formation equipment according to claim 1 or 12 which impresses development bias voltage to said developer at the time of development, and comes to form mutual electric field.

[Claim 19] Image formation equipment according to claim 1 or 12 which comes to use the toner containing a release agent.

[Claim 20] Image formation equipment according to claim 1 or 12 with which circularity comes to use 90 or more toners.

[Claim 21] Image formation equipment according to claim 1 or 12 which comes to use the toner whose half-value width is below  $2.2 [fC / 10 \text{ micrometers}]$  in the distribution curve of (amount of electrifications of toner)/(toner particle size).

[Claim 22] Image formation equipment according to claim 1 or 12 which comes to prepare an elastic layer in said medium imprint object.

[Claim 23] Image formation equipment according to claim 1 or 12 which comes to form in the front face of said medium imprint object at homogeneity the toner adhesion force reduction layer which reduces the adhesion force of a toner.

[Claim 24] Image formation equipment according to claim 23 which comes to form said toner adhesion force reduction layer using zinc stearate.

[Claim 25] Image formation equipment according to claim 23 which comes to form said toner adhesion force reduction layer using a fluoro-resin.

[Claim 26] Image formation equipment according to claim 23 which adheres the particle which uses a brush and it failed to delete from a particle binding object to said medium imprint object, and comes to form said toner adhesion force reduction layer by the adhering particle.

[Claim 27] Along the revolution conveyance direction of said medium imprint object from the location which gives a charge to the front face of the medium imprint object When distance to the location which moves the toner on the medium imprint object is set to  $L_0$ , the surface migration rate of the medium imprint object, a volume resistivity, and specific inductive capacity are set to  $V_L$ ,  $\rho V$ , and  $\epsilon$ , respectively and a vacuum dielectric constant is set to  $\epsilon_0$ , Image formation equipment according to claim 1 or 12 which becomes as  $L_0 - /V_L \rho V - \epsilon - \epsilon_0$ .

[Claim 28] The location which imprints the toner image on said image support on said medium imprint object is made into a primary imprint location. Distance between the shortest primary imprint locations in an adjoining primary imprint location is set to  $L_1$  along the revolution conveyance direction of said medium imprint object. Image formation equipment according to claim 1 which becomes as  $L_1 - /V_L \rho V - \epsilon - \epsilon_0$  when the surface migration rate of the medium imprint object, a volume resistivity, and specific inductive capacity are set to  $V_L$ ,  $\rho V$ , and  $\epsilon$ , respectively and a vacuum dielectric constant is set to  $\epsilon_0$ .

[Claim 29] The location which imprints the toner image on said image support on said medium imprint object is made into a primary imprint location. And when the location which imprints the toner image on said medium imprint object to imprint material is made into a secondary imprint location and distance from said primary imprint location of the lowest style to said secondary imprint location is set to  $L_2$  along the revolution conveyance direction of said medium imprint object, Image formation equipment according to claim 27 which becomes as  $L_2 - /V_L \rho V - \epsilon - \epsilon_0$ .

[Claim 30] The location which imprints the toner image on said medium imprint object to imprint material is made into a secondary imprint location. And the location which removes the residual toner on said medium imprint object with medium imprint object cleaning equipment after an imprint is made into a medium imprint object cleaning location in the secondary imprint location. Image formation equipment according to claim 27 which becomes as  $L_3 - /V_L \rho V - \epsilon - \epsilon_0$  when distance from said secondary imprint location to said medium imprint object cleaning location is set to  $L_3$  along the revolution conveyance direction of said medium imprint object.

[Claim 31] The location which removes the residual toner on said medium imprint object with medium imprint object cleaning equipment after an imprint is made into a medium imprint object cleaning location in a secondary imprint location. And the location which imprints the toner image on said image support on said medium imprint object is made into a primary imprint location. Image formation equipment according to claim 27 which becomes as  $L_4 - /V_L \rho V - \epsilon - \epsilon_0$  when distance from said medium imprint object cleaning location to said primary imprint location of the maximum upstream is set to  $L_4$  along the revolution conveyance direction of said medium imprint object.

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[Translation done.]

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the image formation equipment which a copying machine, a printer, facsimile, or those compound machines repeat electrification, writing, development, an imprint, cleaning, etc., form a toner image serially on image support using two components or 1 component developer, imprint that toner image through a medium imprint object, and forms images, such as a color, 2 colors, and monochrome, on imprint material. And in such image formation equipment, it is related with a monochrome imaging means to constitute a developer and image support cleaning equipment in preparation for the surroundings of image support. And in such a monochrome imaging means, it is related with the toner recycle equipment which conveys to a developer the toner collected with image support cleaning equipment.

[0002]

[Description of the Prior Art] Conventionally, there are what forms a monochromatic monochrome toner image in imprint material, such as a form and an OHP film, and a thing which forms multicolor 2 color toner image or a multicolor color toner image in image formation equipment.

[0003] Among those, with the image formation equipment which forms a monochrome toner image, in preparation for the surroundings of image support, the monochrome imaging means of 1 was constituted for a developer and image support cleaning equipment, the monochrome toner image was formed on image support with the monochrome imaging means of 1, the toner image was directly imprinted from image support, and the image was usually formed on imprint material so that it might be indicated by JP,8-248708,A, for example.

[0004] On the other hand, there are some which imprint the toner image on the medium imprint object, and form an image on imprint material the back in the image-formation equipment which forms a multicolor toner image by once imprinting what imprints directly the toner image formed on image support, and forms an image on imprint material, and the toner image formed on image support on a medium imprint object.

[0005] In the thing of the former direct imprint method, so that it may be indicated by JP,9-288397,A, for example In preparation for the surroundings of image support, a monochrome imaging means is constituted for a developer and image support cleaning equipment. Two or more the monochrome imaging means were put in order along the imprint material conveyance way, tandem imaging equipment was formed, the monochrome toner image was formed with each monochrome imaging means of the tandem imaging equipment, those monochrome toner images were directly imprinted from each image support, and the synthetic toner image was formed on imprint material.

[0006] In the thing of the latter indirect imprint method, the rotary mold developer was used for the monochrome imaging means, the monochrome toner image was serially formed on image support with the rotary mold developer, the sequential imprint of the monochrome toner image was carried out, the synthetic toner image was formed on the medium imprint object, the synthetic toner image was imprinted and the multi-colored picture image was formed on imprint material so that it might be indicated by this official report.

[0007]

[Problem(s) to be Solved by the Invention] By the way, the social request which asks for the toner

which maintenance and saving-resources-izing of a social environment are strongly desired, and is used with image formation equipment carrying out a recycle activity from a viewpoint on ecology in recent years is also becoming large. Moreover, by carrying out a recycle activity, the consumption of a toner can be reduced substantially and a maintenance cost can be lowered.

[0008] For this reason, in the conventional image formation equipment mentioned above, what equips a monochrome imaging means with the toner recycle equipment which conveys to a developer the toner collected with image support cleaning equipment is increasing.

[0009] Also with the image formation equipment which forms a monochrome toner image, or the image formation equipment which forms a multicolor toner image, however, in the case of a direct imprint method Since imprint material contacts image support directly, if foreign matters, such as paper powder, waste, etc. adhering to imprint material, will transfer to image support, the foreign matter will mix into the toner collected with image support cleaning equipment and a recycle activity is carried out There was a problem to which it enters into a recycle toner and image quality falls.

[0010] In the case of an indirect imprint method, since imprint material does not contact image support directly, there is such no problem. However, with the conventional configuration which is indicated by JP,9-288397,A mentioned above, when it was going to carry out the recycle activity of each color toner, the image support cleaning equipment only for [ each ] colors was formed, it must stop having had to establish the device which moreover attaches and detaches them to image support, the configuration was complicated dramatically, and there was a problem that implementation was almost difficult.

[0011] For this reason, it was also being presupposed to what is indicated by this JP,9-288397,A that the recycle activity only of the black toner is carried out.

[0012] Then, the 1st object of this invention is in the image formation equipment which forms a synthetic toner image to enable the recycle activity of the toner according to individual, preventing mixing of the foreign matter to a recycle toner, and preventing deterioration of image quality.

[0013] The 2nd object is in color picture formation equipment to attain such an object.

[0014] The toner in which the 3rd object does not have fear of color mixture in color picture formation equipment is to carry out a recycle activity as much as possible.

[0015] while the 4th object prevents mixing of the foreign matter to a recycle toner and prevents deterioration of image quality in the image formation equipment which forms a synthetic toner image -- recycle of black with little image degradation -- it is in supposing that it is usable.

[0016] In color picture formation equipment, even if it carries out color mixture of the 5th object, it is to make it there be no toner degradation as much as possible.

[0017] The 6th object is in 2 color image formation equipment to attain such an object.

[0018] The 7th object is in the multi-colored picture image formation equipment of the type whose image support is a drum and whose medium imprint object is a belt to attain the 1st object.

[0019] The 8th object has [ both ] image support and a medium imprint object in attaining the 1st object in the multi-colored picture image formation equipment of the type which is a belt.

[0020] The 9th object is in the image formation equipment which forms a synthetic toner image to attain the 1st object, improving maintenance nature.

[0021] The 10th object is in the monochrome imaging means of the image formation equipment which forms a synthetic toner image to enable the recycle activity of an individual toner, preventing mixing of the foreign matter to a recycle toner, and preventing deterioration of image quality.

[0022] The 11th object is in the toner recycle equipment of the image formation equipment which forms a synthetic toner image to enable the recycle activity of an individual toner, preventing mixing of the foreign matter to a recycle toner, and preventing deterioration of image quality.

[0023] The 12th object is in the image formation equipment which forms a monochrome toner image to enable the recycle activity of a toner, preventing mixing of the foreign matter to a recycle toner, and preventing deterioration of image quality.

[0024] The 13th object is in the monochrome image formation equipment of the type whose image support is a drum and whose medium imprint object is a belt or a drum to attain the 12th object of



the above.

[0025] The 14th object is in the monochrome image formation equipment of the type whose image support is a belt and whose medium imprint object is a belt or a drum to attain the 12th object of the above.

[0026] The 15th object is in monochrome image formation equipment to attain the 12th object, improving maintenance nature.

[0027] The 16th object is in the monochrome imaging means of monochrome image formation equipment to enable the recycle activity of a toner, preventing mixing of the foreign matter to a recycle toner, and preventing deterioration of image quality.

[0028] The 17th object is in the toner recycle equipment of monochrome image formation equipment to enable the recycle activity of a toner, preventing mixing of the foreign matter to a recycle toner, and preventing deterioration of image quality.

[0029] The 18th object is in image formation equipment to prevent the impurity of being uncharged or low electrification adhering to image support, and prevent deterioration of much more image quality.

[0030] The 19th object is in image formation equipment to prevent grinding of the toner by friction and prevent deterioration of much more image quality.

[0031] In image formation equipment, the 20th object smooths the shape of surface type of a toner, improves the rate of an imprint of a toner, reduces the amount of recycle toners, prevents degradation of image quality, and is to prevent deterioration of much more image quality.

[0032] The 21st object is set to image formation equipment, in addition loses fluctuation of the component ratio of the toner at the time of toner recycle, prevents degradation of image quality, and is to prevent deterioration of much more image quality.

[0033] In image formation equipment, the 22nd object sticks a medium imprint object to image support, improves the rate of an imprint of a toner, and is to prevent deterioration of much more image quality.

[0034] The 23rd object is to attain the 1st or 12th object of the above, preventing generating of an after-image without improving the cleaning engine performance and causing degradation of a medium imprint body surface.

[0035] The 24th object is to attain the 1st or 12th object of the above, preventing generating of an after-image by reducing the toner adhesion force to a medium imprint object, and improving the cleaning engine performance.

[0036] The 25th object is to attain the 1st or 12th object of the above, preventing generating of an after-image by raising the mold-release characteristic between a medium imprint body surface and a toner, and improving the cleaning engine performance.

[0037] The 26th object is to attain the 1st or 12th object of the above, preventing generating of an after-image simply without causing degradation of a medium imprint body surface, using improvement in the cleaning engine performance as easy.

[0038] The 27th object is to attain the 1st or 12th object of the above, specifying the die length of a medium imprint object, a surface migration rate, a dielectric constant, and a volume resistivity, and lessening imprint Chile by low cost.

[0039]

[Means for Solving the Problem] Therefore, that invention concerning claim 1 should attain the 1st object mentioned above In preparation for the surroundings of image support, a monochrome imaging means is constituted for a developer and image support cleaning equipment. In the image formation equipment which once imprints the toner image formed on the image support of the monochrome imaging means on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material Put two or more monochrome imaging means in order along the revolution conveyance direction of a medium imprint object, and the tandem imaging equipment which forms a multi-colored picture image on a medium imprint object is constituted. It is characterized by the thing it comes to have toner recycle equipment which conveys to a developer the toner collected with image support cleaning equipment for at least two monochrome imaging means among monochrome imaging means to constitute the tandem imaging

equipment.

[0040] Invention concerning claim 2 compounds the monochrome image formed with each monochrome imaging means through a medium imprint object in image formation equipment according to claim 1 that the 2nd object mentioned above should be attained, and is characterized by the thing it comes to form a synthetic color picture on imprint material.

[0041] That the 3rd object mentioned above should be attained, in image formation equipment according to claim 2, invention concerning claim 3 is tandem imaging equipment, and is characterized by the thing it comes to equip toner recycle equipment with a monochrome imaging means to arrange in the revolution conveyance direction maximum upstream location of a medium imprint object.

[0042] Invention concerning claim 4 is characterized by the thing it comes to equip a black monochrome imaging means toner recycle equipment with at least among two or more monochrome imaging means in image formation equipment according to claim 2 that the 4th object mentioned above should be attained.

[0043] That the 5th object mentioned above should be attained, in image formation equipment according to claim 2, invention concerning claim 5 is tandem imaging equipment, and is characterized by the thing it comes to arrange a black monochrome imaging means in the revolution conveyance direction lowest style location of a medium imprint object.

[0044] Invention concerning claim 6 puts in order and establishes two monochrome imaging means along the revolution conveyance direction of a medium imprint object in image-formation equipment according to claim 1, compounds the monochrome image formed with those monochrome imaging means through a medium imprint object that the 6th object mentioned above should attain, and is characterized by the thing it comes to form 2 color images in imprint material.

[0045] Invention concerning claim 7 is characterized by what image support is a drum and a medium imprint object is a belt in claim 1 thru/or image formation equipment given in any 1 of 6 that the 7th object mentioned above should be attained.

[0046] Invention concerning claim 8 is characterized by what both image support and a medium imprint object are belts in claim 1 thru/or image formation equipment given in any 1 of 6 that the 8th object mentioned above should be attained.

[0047] That the 9th object mentioned above should be attained, invention concerning claim 9 prepares image support at least in claim 1 thru/or image formation equipment given in any 1 of 6, and is characterized by the thing it comes to constitute the process cartridge which bundles up to the body of image formation equipment, and is detached and attached.

[0048] A developer and image support cleaning equipment are constituted in preparation for the surroundings of image support that invention concerning claim 10 should attain the 10th object mentioned above. In the monochrome imaging means of the image formation equipment which once imprints the toner image formed on the image support on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material Among those which put more than one in order along the revolution conveyance direction of a medium imprint object, constitute the tandem imaging equipment which forms a multi-colored picture image on a medium imprint object, and constitute the tandem imaging equipment, to at least two things It is characterized by the thing it comes to have toner recycle equipment which conveys to a developer the toner collected with image support cleaning equipment.

[0049] In preparation for the surroundings of image support, a monochrome imaging means is constituted for a developer and image support cleaning equipment that invention concerning claim 11 should attain the 11th object mentioned above. In the toner recycle equipment of the image formation equipment which once imprints the toner image formed on the image support of the monochrome imaging means on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material Put two or more monochrome imaging means in order along the revolution conveyance direction of a medium imprint object, and the tandem imaging equipment which forms a multi-colored picture image on a medium imprint object is constituted. It prepares for at least two monochrome imaging means among monochrome

imaging means to constitute the tandem imaging equipment, and is characterized by the thing it comes to convey to a developer the toner collected with image support cleaning equipment.

[0050] In preparation for the surroundings of image support, a monochrome imaging means is constituted for a developer and image support cleaning equipment that invention concerning claim 12 should attain the 12th object mentioned above. In the image formation equipment which once imprints the toner image formed on the image support of the monochrome imaging means on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material Around a medium imprint object, one monochrome imaging means to form a monochrome image is established on the medium imprint object, and it is characterized by the thing it comes to have toner recycle equipment which conveys to a developer the toner collected with image support cleaning equipment at the monochrome imaging means.

[0051] Invention concerning claim 13 is characterized by what image support is a drum and a medium imprint object is a belt or a drum in image formation equipment according to claim 12 that the 13th object mentioned above should be attained.

[0052] Invention concerning claim 14 is characterized by what image support is a belt and a medium imprint object is a belt or a drum in image formation equipment according to claim 12 that the 14th object mentioned above should be attained.

[0053] That the 15th object mentioned above should be attained, in image formation equipment according to claim 12, invention concerning claim 15 prepares image support at least, and is characterized by the thing it comes to constitute the process cartridge which bundles up to the body of image formation equipment, and is detached and attached.

[0054] A developer and image support cleaning equipment are constituted in preparation for the surroundings of image support that invention concerning claim 16 should attain the 16th object mentioned above. In the monochrome imaging means of the image formation equipment which once imprints the toner image formed on the image support on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material It prepares in the surroundings of a medium imprint object, a monochrome image is formed on the medium imprint object, and it is characterized by the thing it comes to have toner recycle equipment which conveys the toner collected with image support cleaning equipment to said developer.

[0055] In preparation for the surroundings of image support, a monochrome imaging means is constituted for a developer and image support cleaning equipment that invention concerning claim 17 should attain the 17th object mentioned above. In the toner recycle equipment of the image formation equipment which once imprints the toner image formed on the image support of the monochrome imaging means on a medium imprint object, imprints the toner image on the medium imprint object, and forms an image on imprint material Around a medium imprint object, one monochrome imaging means to form a monochrome image is established on the medium imprint object, and it prepares for the monochrome imaging means, and is characterized by the thing it comes to convey to a developer the toner collected with image support cleaning equipment.

[0056] That the 18th object mentioned above should be attained, in image formation equipment according to claim 1 or 12, invention concerning claim 18 impresses development bias voltage to a developer at the time of development, and is characterized by the thing it comes to form mutual electric field.

[0057] Invention concerning claim 19 is characterized by the thing it comes to use the toner containing a release agent in image formation equipment according to claim 1 or 12 that the 19th object mentioned above should be attained.

[0058] Invention concerning claim 20 is characterized by the thing circularity comes to use 90 or more toners in image formation equipment according to claim 1 or 12 that the 20th object mentioned above should be attained.

[0059] Invention concerning claim 21 is characterized by the thing it comes to use the toner whose half-value width is below  $2.2 \text{ [fC / 10 micrometers]}$  in the distribution curve of (amount of electrifications of toner)/(toner particle size) in image formation equipment according to claim 1 or 12 that the 21st object mentioned above should be attained.

[0060] Invention concerning claim 22 is characterized by the thing it comes to prepare an elastic

layer in a medium imprint object in image formation equipment according to claim 1 or 12 that the 22nd object mentioned above should be attained.

[0061] Invention concerning claim 23 is characterized by what it comes to form in the front face of a medium imprint object at homogeneity the toner adhesion force reduction layer which reduces the adhesion force of a toner for in image formation equipment according to claim 1 or 12 that the 23rd object mentioned above should be attained.

[0062] Invention concerning claim 24 is characterized by the thing it comes to form a toner adhesion force reduction layer using zinc stearate in image formation equipment according to claim 23 that the 24th object mentioned above should be attained.

[0063] Invention concerning claim 25 is characterized by the thing it comes to form a toner adhesion force reduction layer using a fluororesin in image formation equipment according to claim 23 that the 25th object mentioned above should be attained.

[0064] Invention concerning claim 26 adheres the particle which uses a brush and it failed to delete from a particle binding object to a medium imprint object in image formation equipment according to claim 23 that the 26th object mentioned above should be attained, and is characterized by the thing it comes to form a toner adhesion force reduction layer by the adhering particle.

[0065] Invention concerning claim 27 is set to image formation equipment according to claim 1 or 12 that the 27th object mentioned above should be attained. Along the revolution conveyance direction of a medium imprint object from the location which gives a charge to the front face of the medium imprint object When distance to the location which moves the toner on the medium imprint object is set to  $L_0$ , the surface migration rate of the medium imprint object, a volume resistivity, and specific inductive capacity are set to  $V_L$ ,  $\rho V$ , and  $\epsilon$ , respectively and a vacuous dielectric constant is set to  $\epsilon_0$ , It is characterized by what is become as  $L_0 - \frac{1}{V_L} \rho V - \epsilon - \epsilon_0$ .

[0066] Invention concerning claim 28 is set to image formation equipment according to claim 1 that the 27th object mentioned above should be attained. The location which imprints the toner image on image support on a medium imprint object is made into a primary imprint location. Distance between the shortest primary imprint locations in an adjoining primary imprint location is set to  $L_1$  along the revolution conveyance direction of a medium imprint object. When the surface migration rate of the medium imprint object, a volume resistivity, and specific inductive capacity are set to  $V_L$ ,  $\rho V$ , and  $\epsilon$ , respectively and a vacuous dielectric constant is set to  $\epsilon_0$ , it is characterized by what is become as  $L_1 - \frac{1}{V_L} \rho V - \epsilon - \epsilon_0$ .

[0067] Invention concerning claim 29 is set to image formation equipment according to claim 27 that the 27th object mentioned above should be attained. The location which imprints the toner image on image support on a medium imprint object is made into a primary imprint location. And when the location which imprints the toner image on a medium imprint object to imprint material is made into a secondary imprint location and distance from the primary imprint location of the lowest style to a secondary imprint location is set to  $L_2$  along the revolution conveyance direction of a medium imprint object, it is characterized by what is become as  $L_2 - \frac{1}{V_L} \rho V - \epsilon - \epsilon_0$ .

[0068] Invention concerning claim 30 is set to image formation equipment according to claim 27 that the 27th object mentioned above should be attained. The location which imprints the toner image on a medium imprint object to imprint material is made into a secondary imprint location. And the location which removes the residual toner on a medium imprint object with medium imprint object cleaning equipment after an imprint is made into a medium imprint object cleaning location in the secondary imprint location. When distance from a secondary imprint location to a medium imprint object cleaning location is set to  $L_3$  along the revolution conveyance direction of a medium imprint object, it is characterized by what is become as  $L_3 - \frac{1}{V_L} \rho V - \epsilon - \epsilon_0$ .

[0069] Invention concerning claim 31 is set to image formation equipment according to claim 27 that the 27th object mentioned above should be attained. The location which removes the residual toner on a medium imprint object with medium imprint object cleaning equipment after an imprint is made into a medium imprint object cleaning location in a secondary imprint location. And when the

location which imprints the toner image on image support on a medium imprint object is made into a primary imprint location and distance from a medium imprint object cleaning location to the primary imprint location of the maximum upstream is set to  $L_4$  along the revolution conveyance direction of a medium imprint object, it is characterized by what is become as  $L_4 - \sqrt{V - \epsilon - \epsilon} \cdot 0$ .

[0070]

[Embodiment of the Invention] Hereafter, it explains per gestalt of implementation of this invention, referring to a drawing. Drawing 1 shows the gestalt of 1 implementation of this invention, and is a whole outline block diagram in a color copying machine.

[0071] The feed table on which the sign 100 in drawing puts the body of a copying machine, and 200 puts it, the scanner which attaches 300 on the body 100 of a copying machine, and 400 are manuscript automatic transferring machines (ADF) further attached on it.

[0072] The endless belt-like medium imprint object 10 is established in the center at the body 100 of a copying machine. As shown in drawing 2, the medium imprint object 10 builds the base layer 11 with a pile ingredient to the mileage of a fluororesin, sail cloth, etc., and forms the elastic layer 12 on it. The elastic layer 12 is built with a fluororubber, acrylonitrile-swine JIEN copolymerization rubber, etc. The front face of the elastic layer 12 coats for example, fluorine system resin, and comes to cover it in the good coat layer 13 of smooth nature.

[0073] And in the example of a graphic display, a time is hung and carried out to three support rollers 14-15-16, and revolution conveyance is enabled at the clockwise rotation in drawing as shown in drawing 1.

[0074] In this example of a graphic display, the medium imprint object cleaning equipment 17 from which the residual toner which remains on the medium imprint object 10 after an image imprint is removed on the left of the support roller 15 of [ 2nd ] three is formed.

[0075] Moreover, on the medium imprint object 10 stretched and passed between the 1st support roller 14 of three, and the 2nd support roller 15, along the conveyance direction, four monochrome imaging means 18 of black cyanogen Magenta Hierro are arranged side by side horizontally, and tandem imaging equipment 20 is constituted.

[0076] Now, as shown in drawing 1, on tandem imaging equipment 20, an aligner 21 is formed further.

[0077] On the other hand, on both sides of the medium imprint object 10, a tandem imaging equipment 20 and opposite side is equipped with secondary imprint equipment 22. Secondary imprint equipment 22 builds over and constitutes the secondary imprint belt 24 which is an endless belt between two rollers 23 from an example of a graphic display, through the medium imprint object 10, it is pressed against the 3rd support roller 16, and it arranges it, and imprints the image on the medium imprint object 10 to imprint material.

[0078] The anchorage device 25 established in the transfer picture on imprint material is formed beside secondary imprint equipment 22. An anchorage device 25 presses and constitutes the application-of-pressure roller 27 to the fixation belt 26 which is an endless belt.

[0079] It comes to also prepare the imprint material conveyance function to convey the imprint material after an image imprint to this anchorage device 25 for the secondary imprint equipment 22 mentioned above. Of course, a non-contact charger may be arranged as secondary imprint equipment 22, and, in such a case, it becomes difficult to have this imprint material conveyance function collectively.

[0080] In addition, in the example of a graphic display, the tandem imaging equipment 20 and parallel which were mentioned above under such secondary imprint equipment 22 and an anchorage device 25 are equipped with the imprint material turnover device 28 which reverses imprint material to both sides of imprint material that an image should be formed.

[0081] Now, when taking a copy using this color copying machine now, a manuscript is set on the manuscript base 30 of the manuscript automatic transferring machine 400. Or the manuscript automatic transferring machine 400 is opened, a manuscript is set on the contact glass 32 of a scanner 300, and the manuscript automatic transferring machine 400 is closed, then it presses down.

[0082] And when the non-illustrated start switch was pushed, a manuscript is conveyed, it moves to up to contact glass 32, when a manuscript is set in the manuscript automatic transferring machine 400 and a manuscript is set on contact glass 32 the back, a scanner 300 is driven promptly and it runs the 1st transit object 33 and the 2nd transit object 34. And while discharging light from the light source with the 1st transit object 33, the reflected light from a manuscript side is reflected further, and it reflects by the mirror of the 2nd transit object 34 towards the 2nd transit object 34, reads through the image formation lens 35, and puts into a sensor 36, and the content of a manuscript is read.

[0083] Moreover, if a non-illustrated start switch is pushed, revolution actuation of one of the support rollers 14-15-16 will be carried out with a non-illustrated drive motor, the follower revolution of other two rollers will be carried out, and revolution conveyance of the medium imprint object 10 will be carried out. Simultaneously, the image support 40 is rotated with each monochrome imaging means 18, and the monochrome image of Black Hierro Magenta cyanogen is formed on each image support 40, respectively. And with conveyance of the medium imprint object 10, the sequential imprint of those monochrome images is carried out, and a synthetic color picture is formed on the medium imprint object 10.

[0084] On the other hand, if a non-illustrated start switch is pushed, the selection revolution of one of the feed rollers 42 of the feed table 200 will be carried out, and it lets out imprint material from one of the sheet paper cassettes 44 with which the paper bank 43 is equipped multistage, one sheet dissociates at a time with the separation roller 45, and it puts into the feed way 46, it conveys with the conveyance roller 47, leads to the feed way 48 within the body 100 of a copying machine, and dashes and stops to the resist roller 49.

[0085] Or the feed roller 50 is rotated and it lets out the imprint material on a detachable tray 51, and one sheet dissociates at a time with the separation roller 52, and it puts into the manual paper feed way 53, and, similarly dashes and stops on the resist roller 49. A form, an OHP film, etc. are used as imprint material.

[0086] And timing is doubled with the synthetic color picture on the medium imprint object 10, the resist roller 49 is rotated, imprint material is sent in between the medium imprint object 10 and secondary imprint equipment 22, it imprints with secondary imprint equipment 22, and a color picture is formed on imprint material.

[0087] It conveys with secondary imprint equipment 22, and sends into an anchorage device 25, and heat and a pressure are applied with an anchorage device 25, the imprint material after an image imprint is established, and the back, a transfer picture is switched by the change-over pawl 55, and is discharged with the blowdown roller 56, and it carries out a stack on a paper output tray 57. Or it switches by the change-over pawl 55, and puts into the imprint material turnover device 28, and it is reversed there, and leads to an imprint location again, an image is formed also in a rear face, and it discharges on a paper output tray 57 with the blowdown roller 56 the back.

[0088] On the other hand, the medium imprint object 10 after an image imprint is medium imprint object cleaning equipment 17, removes the residual toner which remains on the medium imprint object 10 after an image imprint, and equips the image formation for the second time by tandem imaging equipment 20 with it.

[0089] Now, in the tandem imaging equipment 20 mentioned above, in detail, each monochrome imaging means 18 becomes in preparation for the surroundings of the drum-like image support 40 about electrification equipment 60, 61 or primary developer imprint equipment 62, image support cleaning equipment 63, an electric discharger 64, etc., as shown in drawing 3. Although the image support 40 has the shape of a drum which applied the organic photo conductor which has photosensitivity to element tubes, such as aluminum, and formed the sensitization layer in them in the example of a graphic display, it may be an endless belt-like.

[0090] Although a graphic display abbreviation is carried out, the image support 40 is formed at least, a process cartridge is formed at all or a part of parts which constitutes the monochrome imaging means 18, it bundles up to the body 100 of a copying machine, and maintenance nature may be made to improve as attachment and detachment being free.

[0091] Among the parts which constitute the monochrome imaging means 18, electrification



equipment 60 is built with the example of a graphic display in the shape of a roller, and is charged in the image support 40 by contacting the image support 40 and impressing an electrical potential difference.

[0092] Although a 1 component developer may be used for a developer 61, in the example of a graphic display, the two component developer which consists of a magnetic carrier and a nonmagnetic toner is used for it. And it constitutes from the stirring section 66 which conveys stirring the two component developer and adheres to the development sleeve 65, and the development section 67 which transfers the toner of the two component developers adhering to the development sleeve 65 to the image support 10, and let the stirring section 66 be a low location from the development section 67.

[0093] Two parallel screws 68 are formed in the stirring section 66. Between two screws 68, it divides with a diaphragm 69 except for both ends (refer to drawing 6 ). Moreover, the toner concentration sensor 71 is attached in the development case 70.

[0094] On the other hand, while countering the development section 67 with the image support 40 through opening of the development case 70 and forming the development sleeve 65 in it, a magnet 72 is fixed and formed in the development sleeve 65. Moreover, the development sleeve 65 is approached in a head, and a doctor blade 73 is formed. In the example of a graphic display, spacing in the closest-approach section between a doctor blade 73 and the development sleeve 65 is set as 500 micrometers.

[0095] And conveyance circulation is carried out stirring 2 component developer by two screws 68, and the development sleeve 65 is supplied. The developer supplied to the development sleeve 65 is pumped up with a magnet 72, is held, and forms a magnetic brush on the development sleeve 65. The ear end of the magnetic brush is carried out with a doctor blade 73 with the revolution of the development sleeve 65 at a proper amount. The cut-off developer is returned to the stirring section 66.

[0096] On the other hand, among the developers on the development sleeve 65, a toner is transferred to the image support 40 with the development bias voltage impressed to the development sleeve 65, and forms the electrostatic latent image on the image support 40 into a visible image. After the formation of a visible image, the developer which remained on the development sleeve 65 separates from the development sleeve 65 in the place which does not have the magnetism of a magnet 72, and returns to the stirring section 66. By this repeat, if the toner concentration in the stirring section 66 becomes thin, it will be detected by the toner concentration sensor 71, and toner makeup will be carried out at the stirring section 66.

[0097] Incidentally, in the example of a graphic display, linear velocity of 200 mm/s and the development sleeve 65 is made into 240 mm/s for the linear velocity of the image support 40. A development stroke is performed [ diameter ] in the diameter of 50mm and the development sleeve 65, using the diameter of the image support 40 as 18mm. The amount of toner electrifications on the development sleeve 65 is the range of  $-10 \sim -30 \mu\text{C/g}$ . The development gap GP which is the gap of the image support 40 and the development sleeve 65 can aim at improvement in development effectiveness by being able to set up in [ conventional ] 0.8 to 0.4mm, and making a value small.

[0098] Thickness of the image support 40 is set to 30 micrometers, the diameter of the beam spot of optical system is set to 50x60 micrometers, and the quantity of light is set to 0.47mW. Moreover, development bias voltage is made into -470V, development potential 350V [ i.e., ], using -700V and the exposure afterpotential VL as -120V for the electrification (before exposure) potential V0 of the image support 40, and a development process is performed.

[0099] Next, primary imprint equipment 62 is made into the shape of a roller, and is pressed and formed in the image support 40 on both sides of the medium imprint object 10. Independently, you may be not only the shape of a roller but a non-contact charger.

[0100] Image support cleaning equipment 63 contacts the image support 40 in a periphery, and is equipped with the conductive fur brush 76 free [ a revolution ] to the direction indicated by the arrow while it presses a head against the image support 40, for example, is equipped with the cleaning blade 75 made of a polyurethane rubber. Moreover, it has the metal electric-field roller 77

which impresses bias to the fur brush 76 free [ a revolution ] to the direction indicated by the arrow, and the head of a scraper 78 is pressed against the electric-field roller 77. Furthermore, the recovery screw 79 which collects the removed toners is formed.

[0101] And the fur brush 76 which rotates in the direction of a counter to the image support 40 removes the residual toner on the image support 40. The toner adhering to the fur brush 76 is removed with the electric-field roller 77 which rotates in the direction of a counter to the fur brush 76, and impresses bias. The electric-field roller 77 is cleaned with a scraper 78. By the recovery screw 79, the toner collected with image support cleaning equipment 63 is brought near by one side of image support cleaning equipment 63, with the toner recycle equipment 80 mentioned later in detail, is returned to a developer 61 and reused.

[0102] An electric discharger 64 is a lamp, irradiates light and initializes the surface potential of the image support 40.

[0103] And with the revolution of the image support 40, the front face of the image support 40 is first charged uniformly with electrification equipment 60, the write-in light L by laser, LED, etc. is irradiated from the aligner 21 subsequently mentioned above according to the content of read of a scanner 300, and an electrostatic latent image is formed on the image support 40.

[0104] Then, a toner is adhered with a developer 61, the electrostatic latent image is formed into a visible image, and the visible image is imprinted on the medium imprint object 10 with primary imprint equipment 62. The front face of the image support 40 after an image imprint removes and cleans a residual toner with image support cleaning equipment 63, discharges it with an electric discharger 64, and image formation for the second time is equipped with it.

[0105] Drawing 4 is the important section enlarged drawing of the color copying machine shown in drawing 1 . In this drawing, after each sign of each image support 40 of each monochrome imaging means 18 of tandem imaging equipment 20, and its monochrome imaging means 18, each developer 61, each image support cleaning equipment 63, and the each primary imprint equipment 62 that counters the image support 40 of each monochrome imaging means 18, respectively, and is formed in it respectively — Black's case — BK — in the case of Hierro, in the case of a Magenta, M is attached, in the case of cyanogen, C is attached, and Y is shown.

[0106] With the tandem imaging equipment 20 of the example of a graphic display, the monochrome imaging means 18 is arranged from the upstream in order of Hierro, cyanogen, a Magenta, and Black to a lower stream of a river along the hand of cut of the medium imprint object 10 as this drawing 4 shows. Thus, if black monochrome imaging means 18BK is arranged in the lowest style location, even if the toner on the medium imprint object 10 will transfer on image support 40C, color mixture cannot be conspicuous and the recycle activity of the toner can be carried out.

[0107] And it is good to equip with toner recycle equipment 80 a monochrome imaging means 18 to arrange especially in the revolution conveyance direction maximum upstream location of the medium imprint object 10, and it good for monochrome imaging means 18BK of black with little [ at least ] toner degradation to have toner recycle equipment 80. [ that what is necessary is just to equip at least two monochrome imaging means 18 with toner recycle equipment 80 in this invention ] However, it comes to prepare toner recycle equipment 80 for all the monochrome imaging means 18 in the example of a graphic display.

[0108] The toner recycle equipment 80 is shown in drawing 5 and drawing 6 . The roller section 82 which has a pin 81 at the end is formed in the recovery screw 79 of image support cleaning equipment 63 as shown in drawing 5 . And the 1 side of the belt-like recovery toner conveyance member 83 of toner recycle equipment 80 is hung on the roller section 82, and a pin 81 is put into it at the long hole 84 of the recovery toner conveyance member 83. It comes to prepare a wing 85 in the periphery of the recovery toner conveyance member 83 every fixed spacing, in addition a side is hung on the roller section 87 of a revolving shaft 86.

[0109] The recovery toner conveyance member 83 is put in in the conveyance way case 88 shown in drawing 6 with a revolving shaft 86. The conveyance way case 88 is built to a cartridge case 89 and one, and it comes to put one of two screws 68 which the developer 61 mentioned above into the edge by the side of the developer 61.



[0110] And while transmitting driving force from the exterior and rotating the recovery screw 79, revolution conveyance of the recovery toner conveyance member 83 is carried out, the toner collected with image support cleaning equipment 63 is conveyed to a developer 61 through the inside of the conveyance way case 88, and it puts in a developer 61 by the revolution of a screw 68. Then, conveyance circulation is carried out stirring with the developer which are two screws 68 and is already in a developer 61, the development sleeve 65 is supplied, the ear end is carried out with a doctor blade 73, the back, a rearrangement is carried out to the image support 40, and the latent image on the image support 40 is developed as mentioned above.

[0111] In the example of a graphic display, since a monochrome imaging means 18 to constitute a developer 61 and image support cleaning equipment 63 in preparation for the surroundings of the image support 40 is equipped with the toner recycle equipment 80 which conveys the toner collected with image support cleaning equipment 63 to a developer 61 in the image formation equipment which forms a color picture, the recycle activity of each color toner can be enabled.

[0112] Moreover, in accordance with the medium imprint object 10, put two or more monochrome imaging means 18 in order, and tandem imaging equipment 20 is constituted. A synthetic toner image is formed on the medium imprint object 10 with the tandem imaging equipment 20. Since the synthetic toner image is imprinted and an image is formed on imprint material (i.e., since it imprints through the medium imprint object 10 and an image is formed on imprint material), it is made for imprint material not to contact the image support 40 directly. Foreign matters, such as paper powder, waste, etc. adhering to the imprint material, can prevent mixing to a recycle toner, and can prevent deterioration of image quality.

[0113] In addition, it depends for the rate of an imprint on resistance greatly. Generally imprint material has high hygroscopicity and its resistance fluctuation to environmental variations, such as temperature and humidity, is large. On the other hand, the medium imprint object 10 mainly has resistance fluctuation of as opposed to [ using the big thing of resistance in many cases ] an environmental variation smaller than imprint material, such as a resin ingredient. Then, if an indirect imprint is carried out through the medium imprint object 10 and an image is formed on imprint material like the example of a graphic display mentioned above, resistance fluctuation to an environmental variation can be lessened compared with the direct imprint method directly imprinted to imprint material, and the rate of an imprint can be stabilized.

[0114] In addition, the example of a graphic display mentioned above explained the case where it applied to the color copying machine which forms a monochrome image with each monochrome imaging means 18, compounds those monochrome images and forms a synthetic color picture in imprint material.

[0115] However, this invention puts in order and establishes not only color picture formation equipment but two monochrome imaging means 18. Also to 2 color image formation equipment which forms a monochrome image with those monochrome imaging means 18, imprints those monochrome images through a medium imprint object, and forms 2 color images in imprint material. By equipping each monochrome imaging means 18 with the toner recycle equipment 63 which conveys the toner collected with image support cleaning equipment 63 to a developer 61, it can apply similarly and the same effectiveness can be acquired.

[0116] A toner mixes an electrification control agent (CCA) and a coloring material to resin, such as polyester, polyol, and a styrene acrylic, and the electrification property and a fluidity are raised by \*(ing) matter, such as a silica and titanium oxide, outside around it. The range of the particle size of an additive is usually 0.1–1.5 [μm]. A coloring material can raise carbon black, a copper phthalocyanine blue, Quinacridone, carmine, etc. An electrification polarity is negative electrification in the example of a graphic display.

[0117] A toner can use what is \*(ing) the additive of the above-mentioned class outside for the parent toner which carried out distributed mixing of the wax etc. Although a toner is created by the grinding method by the explanation so far, what was created by the polymerization method etc. is usable. As for the toner generally created by the polymerization method, the heating method, etc., it becomes to form a shape factor to 90% or more, and the coverage of the additive by the configuration also becomes very higher still.

[0118] Here, properly speaking [ a shape factor ], it serves as a degree of sphericity, is defined by "a particle, and surface area \*100% of the surface area / real particle of the ball of this volume", but since measurement becomes quite difficult, it is computed by circularity. The definition carries out to projection profile die-length \*100% of "the circumference / real particle" with the same projected area as a particle of a circle. It will approach to 100%, so that the projected circle will approach a perfect circle, if it does so.

[0119] 3-12 micrometers is suitable for the range of the volume mean particle diameter of a toner, it is referred to as 6 micrometers in the example of a graphic display, and it can be enough dealt also with the image of the high resolution of 1200 or more dpi.

[0120] A magnetic particle uses a metal or resin as a core, magnetic materials, such as a ferrite, are contained, and a surface is covered with silicon resin etc. The range of particle size of 20-50 micrometers is good. Moreover, the range of resistance of 104-106ohm is the optimal at dynamic resistance. However, a measuring method is the measured value when supporting on the roller (phi20;600RPM) which connoted the magnet, making the electrode of width of face of 65mm, and die-length 1mm area contact by gap 0.9mm, and impressing the applied voltage of proof-pressure upper limit level (several [ A high resistance silicon coat carrier 400 V to an iron powder carrier ] V).

[0121] The development sleeve 65 has the configuration of the nonmagnetic shape of a pivotable sleeve, and is arranging two or more magnets 72 in the interior. A magnet 72 is made to act magnetism when a developer passes through a predetermined location, since it is fixed. in the example of a graphic display, the diameter of the development sleeve 65 is set to phi 18, a front face performs processing which forms two or more slots which have sandblasting or a depth of 1-several mm, and it goes into the range of 10-30micromRZ -- as -- oh, it is carrying out.

[0122] A magnet 72 has five magnetic poles of N1, S1, N2, S2, and S3 in the hand of cut of the development sleeve 65 from the part of a doctor blade 73. it forms with a magnet 72 -- having had (toner + magnetic particle) -- it is supported on the development sleeve 65 as a developer, and a toner obtains the regular amount of electrifications by being mixed with a magnetic particle. In the example of a graphic display, the range of -10--30[muC/g] is suitable. The development sleeve 65 counters the image support 40, and is arranged in the field by the side of 72 magnetS1 in which the magnetic brush of a developer was formed.

[0123] By the way, while forming tandem imaging equipment 20 in multi-colored picture image formation equipment above, the case where it had toner recycle equipment 80 was explained. However, in the case of monochrome image formation equipment, as shown in drawing 7 , it constitutes. In drawing 7 , the same sign is attached and duplication explanation is abbreviated to having given the corresponding point of the example mentioned above.

[0124] With the monochrome image formation equipment shown in drawing 7 , in preparation for the surroundings of the image support 40, the monochrome imaging means 18 is constituted for a developer 61 and image support cleaning equipment 63, a toner image is formed on the image support 40 using the monochrome imaging means 18, the toner image is once imprinted on the medium imprint object 10, the back, the toner image on the medium imprint object 10 is imprinted, and a monochrome image is formed on imprint material.

[0125] The monochrome imaging means 18 is equipped with the toner recycle equipment 80 which conveys the toner collected with image support cleaning equipment 63 to a developer 61. Like the example mentioned above, toner recycle equipment 80 is constituted, as shown in drawing 5 and drawing 6 .

[0126] Although the image support 40 is a drum and the medium imprint object 10 is a belt in the example shown in this drawing 7 , as shown in drawing 8 , the medium imprint object 10 is good also as a drum. This drawing 8 also attaches the same sign and abbreviates duplication explanation to having given the corresponding point of the example mentioned above. In addition, the image support 40 is also good not only as a drum but a belt similarly.

[0127] Moreover, similarly, the image support 40 may be formed at least and the process cartridge which bundles up to the body of image formation equipment, and is detached and attached may consist of examples shown in these drawing 7 and drawing 8 .

[0128] Next, it explains in full detail below about the development bias voltage impressed to a developer 61 at the time of development.

[0129] As shown in a developer 61 in illustration at drawing 9, the development sleeve 65 is formed. And the oscillating bias voltage which superimposed alternating voltage on direct current voltage as development bias voltage according to the power source 90 is impressed to the development sleeve 65 at the time of development. Background potential and image section potential are located between the maximum of the above-mentioned oscillating bias voltage, and the minimum value. Of this, the mutual electric field from which the sense changes by turns are formed in the development section A. And the toner and magnetic particle of a developer vibrate violently in this mutual electric field, swing OFF flies the development sleeve 65 and the electrostatic restraint to a magnetic particle to the image support 40, and a toner adheres corresponding to the latent image of the image support 40.

[0130] The difference (electrical potential difference between peaks) of the maximum of oscillating bias voltage and the minimum value has desirable 0.5-5kV, and is [ a frequency ] desirable. [ of 1-10kHz ] A square wave, a sine wave, a chopping sea, etc. can be used for the wave of oscillating bias voltage. The direct-current-voltage component of oscillating bias is a value between background potential and image section potential, as described above, but its direction which is a value near [ potential / image section ] background potential is desirable when preventing adhesion of the fogging toner to a background potential field.

[0131] When the wave of oscillating bias voltage is a square wave, it is desirable to make a duty ratio into 50% or less. Here, a duty ratio is the rate of time amount that a toner tends to go to the image support 40 in 1 period of oscillating bias voltage. Since the difference of the peak value and the time amount average of bias by which a toner tends to go to the image support 40 by doing in this way can be enlarged, motion of a toner can activate further, a toner can adhere in potential distribution of a latent-image side faithfully, and a feeling of a rough deposit and resolution can be raised.

[0132] Moreover, with a toner, since the magnetic particle which has the charge of reversed polarity can make small the difference of the peak value and the time amount average of bias which are going to go to the image support 40, motion of a carrier can be calmed down and the probability for a magnetic particle to adhere to the background of a latent image can be reduced substantially. Moreover, even if the impurity of being un-charged or low electrification exists, negatives are not developed, but image quality can be maintained, without image degradation occurring, since it does not adhere to the image support 40.

[0133] Next, the toner used with a developer is explained below.

[0134] A release agent is contained in a toner. As a release agent, a polyolefine WA@KKUSU (polyethylene wax, polypropylene wax, etc.); long-chain hydrocarbons (paraffin WA@KKUSU, SAZORU wax, etc.); carbonyl group content wax etc. is mentioned. A thing desirable [ among these ] is a carbonyl group content wax. as a carbonyl group content wax -- poly alkane acid ester (carnauba wax --) A montan wax, trimethylol propane tribehenate, pentaerythritol tetra-behenate, Pentaerythritol diacetate dibehenate, glycerine tribehenate, ; poly alkanol ester (a trimellitic acid tris RISUTE allyl compound --), such as 1 and 18-OKUTA decane diol distearate ; poly alkane acid amides, such as distearyl maleate (ethylenediamine dibehenyl amide etc.); poly alkylamide (trimellitic acid tris TEARIRU amide etc.);, dialkyl ketones (distearyl ketone etc.), etc. are mentioned.

[0135] A desirable thing is poly alkane acid ester among these carbonyl group content waxes. The melting point of the wax of this invention is usually 40-160 degrees C, and is 60-90 degrees C still more preferably 50-120 degrees C preferably. The wax with which a less than 40-degree C wax has an adverse effect on heat-resistant shelf life, and the melting point exceeds 160 degrees C is a lifting and a cone about cold offset at the time of fixation at low temperature. Moreover, as measured value in temperature higher 20 degrees C than the melting point, 5-1000cps is desirable still more desirable, and the dissolution viscosity of a wax is 10-100cps. The wax exceeding 1000cps is deficient in the hot-proof offset nature and low-temperature fixable improvement effectiveness. The content of the wax in a toner is 0 - 40 usual % of the weight, and is 3 - 30 % of

the weight preferably.

[0136] If a toner is made to contain a release agent, oilless fixation will be attained by making a toner release from mold, without applying release agents, such as a silicone oil, with an anchorage device 25. Moreover, when a wax exists in the outside of toner resin, so to speak, the duty of lubricant is achieved. Toner resin itself is not ground by contact to a cleaning member by this effectiveness, either, without hurting. Incidentally, with the wax non-added toner, when the quality assurance test with the passage of time by the existence of a wax was carried out, although the toner deteriorated in 190K sheets, whenever [ condensation ] rose, development capacity fell and image quality deteriorated, with the toner of carnauba wax 3wt% content, without a toner deteriorating to 250K sheets, recycle was able to be continued and image quality was able to be maintained.

[0137] Next, a toner configuration is explained below.

[0138] What was created by the grinding method and the polymerization method can be used for a toner. The toner created by this approach can smooth a front face, and it is possible for a shape factor, i.e., circularity, to create 90% or more of toner. Generally a conglomeration toner can express the index with a degree of sphericity. A degree of sphericity falls as it becomes a grinding toner, using a true ball as 1.

[0139] If circularity of the image projected in the degree of sphericity is set to SR, it can be defined as  $SR = (\text{boundary length of boundary-length} / \text{particle projection image of circle of same area as particle projected area}) \times 100\%$ , and will become such a value near 100% that a toner is close to a true ball.

[0140] The effectiveness of conglomeration of a toner is explained as compared with the conventional grinding mold (infinite form) toner. Toner B (this example) is titanium oxide 0.7wt% silica 0.5wt% similarly to Toner A (silica 0.2wt% and titanium oxide 0.3wt%) conventionally. One of the main functions of an additive is preventing lowering the cohesive force of toners and a toner serving as an aggregate, changing it into "the condition of having unfolded", if possible, and acquiring uniform development and an imprint property. When the rate of adhering to the surroundings of a parent toner is considered by coverage, since Toner B is close to a globular form, as compared with Toner A, its surface area is conventionally small at this time. The part and the coverage by the additive of Toner B increase, and development capacity increases that it is easy to move in the development sleeve 65 top because a fluidity improves. If circularity uses 90 or more toners, when a front face becomes smooth, the rate of an imprint will improve and the value of 92% in the rate of an imprint will be acquired to 88% with the conventional grinding toner. Since the amount of recycle toners decreases "Swerve" and it is hard coming to win popularity the effect of toner grinding at the time of recycle etc., an image does not deteriorate.

[0141] Next, the distribution curve of (amount of electrifications of toner)/(toner particle size) is explained below.

[0142] The particle size of the toner on the development sleeve 65 and the amount distribution of electrifications are measured. In measurement, it is E-SPART by Hosokawa Micron CORP. ANALYZER was used. This E-SPART Although detailed explanation of ANALYZER is omitted, air is sprayed and flown to the toner on the development sleeve 65, and the particle size of toner each in catching the motion in electric field and the data of the amount of electrifications can be obtained. Incidentally, in this check experiment, 3000 toners were sampled and the difference of distribution was seen. Moreover, distribution of  $q/d$  which mainly  $q$  (ed) the amount of electrifications of a toner with toner particle size is compared here. This comes from the amount of electrifications being dependent on the particle size of a toner.

[0143] The toner used in the example has the optimal toner which created the polyester by which conversion was carried out by the dry type toner and polymerization method which are contained as a toner binder at least. What used the former toner is explained. The shape factor of a toner is  $SF=95\%$ . Then, when this particle size of the toner on a development sleeve and the amount distribution of electrifications are measured in first stage, the amount distribution of electrifications is Sharp so that it may be shown drawing 10. And the half-value width was 1.1 [ $\mu\text{C} / 10$  micrometers].

[0144] Generally, the index about sharpness is expressed with half-value width, and its one where the value is smaller is sharp. Generally many toners which have q/d of a near value with distribution being sharp will exist, and uniform development can be attained from development capacity being the same. Since the range of the amount of toner electrifications which exists reversely if distribution serves as broadcloth spreads also in the range of breadth and development capacity, while fluctuation of the amount of development will arise, if the amount side of low electrifications increases, it will become easy to generate a greasing.

[0145] Next, when asked for the same half-value width after recycle, it was 1.7 [fC / 10 micrometers]. Furthermore, when the value after recycle was measured by the system which used the common grinding toner, it was 2.7 [fC / 10 micrometers]. This is inserted into the blade whose toner's is a cleaning member, and the image support 40 at the time of cleaning, and a toner becomes ground [ tend ] by the thrust. If it does so, since it adheres to toner with the still more nearly another diameter toner of a granule with the abundance ratio of the toner of the diameter of a granule increasing to mean particle diameter, it becomes in secondary particle and it exists as a diameter toner of a large drop, q/d distribution broadcloth-izes.

[0146] Although the above-mentioned half-value width and the relation of a greasing were shown in drawing 11 , if 2.2 is exceeded, it turns out that the threshold value 0.08 (the difference of the reflection density to the transfer paper non-developed negatives is used as  $\Delta ID$ ) of a greasing is exceeded. From this, the greasing property after recycle is falling with the conventional grinding toner. However, if half-value width uses the toner which is 2.2 or less, even if it recycles, sufficient amount of electrifications will be maintained and image quality will not deteriorate.

[0147] Next, elasticity-ization of the medium imprint object 10 is explained below.

[0148] The range of the degree of hardness HS of the medium imprint object 10 is preferably made into  $10 \leq HS \leq 60$  degree (JIS-A). Although a degree of hardness is sufficiently low when a belt is used, it may slip in the actuation transfer section. If the roller of the rigid body is used to it, the nonuniformity to a revolution, i.e., transit, can be decreased extremely. However, if a degree of hardness is too high, possibility that whenever [ by precision / allowances ] will not stick to narrowing and the image support 40 well will also come out. Then, a degree of hardness is made low by forming the elastic layer 12, flexibility is given to the medium imprint object 10, whenever [ with the image support 40 / adhesion allowances ] tends to be raised, the rate of an imprint tends to be raised, image degradation tends to be avoided by reducing the amount of recycle toners, and it is going to maintain image quality.

[0149] The thing below degree-of-hardness JIS-A of 10 degrees is dramatically difficult to fabricate with sufficient dimensional accuracy. This originates in it being easy to receive contraction and expansion at the time of molding. Moreover, although it is a general approach to make an oil component contain to a base material when making it soft, it has the fault of oozing out if it carries out in the state of application of pressure at the time of continuation actuation. It turned out that the toner which \*\* on medium imprint object 10 front face is made to pollute by this, and the rate of an imprint falls remarkably.

[0150] On the other hand, since the thing more than degree-of-hardness JIS-A of 60 degrees becomes possible [ that it can fabricate with a sufficient part precision for the degree of hardness to have gone up, and stopping an oil content few ], the stain resistance to a toner can be reduced. However, since the usable range in consideration of contact pressure narrows, it is necessary to eat and to set the amount of lumps, or contact pressure as accuracy. The medium imprint roller A (degree-of-hardness JIS-A of 61 degrees) is compared with the medium imprint roller B (degree-of-hardness JIS[ of 40 degrees ]-A) which is an example of this invention, and it explains.

[0151] Drawing 12 makes contact pressure a parameter and is the thing to the degree of hardness and the image support 40 of the medium imprint object 10 which ate and showed the relation of the amount of lumps. It eats. the time of putting in the range of fluctuation of contact pressure within the limits of three to 12 gf/mm with the medium imprint roller A with three to 8 gf/mm, and the medium imprint roller B — the — lump \*\*\*\* 0.02mm, respectively It is set to 0.05mm and dimensional accuracy must be increased about 2.5 times with the medium imprint roller A as compared with the medium imprint roller B.

[0152] Therefore, whenever [ allowances ] spreads [ the direction of the type of the medium imprint roller B ]. The change of the opening of the image support 40 and the medium imprint object 10 of spread [ whenever / allowances ] decreases, and I think that the rate of an imprint is stabilized. Reversely, when a degree of hardness is high, it eats, change of the amount of lumps becomes large, and the rate of an imprint falls. As opposed to the conventional medium imprint roller A with a comparatively high degree of hardness (degree-of-hardness JIS-A of 61 degrees) with the medium imprint roller B of this invention (degree-of-hardness JIS-A of 40 degrees) Since the value of 94% will be acquired with the medium imprint roller B of this invention to 90% in the conventional medium imprint roller A if the rate of an imprint is measured and it is [ the amount of recycle of a toner decreases and ] hard coming to win popularity the effect of toner grinding at the time of recycle etc., an image does not deteriorate.

[0153] By the way, in the example shown in drawing 13, the fur brush 92 and a cleaning blade 93 are formed in medium imprint object cleaning equipment 17 as a cleaning member. The fur brush 92 is formed so that the medium imprint object 10 may be contacted and it may rotate in the direction of a counter to it. On the other hand, a cleaning blade 93 is the down-stream location of the fur brush 92, and it is prepared so that a head may be pressed against the medium imprint object 10 in support of a end face. The sign 94 in drawing 13 is the toner conveyance member of the shape of a coiled form or a screw.

[0154] And with a revolution of the medium imprint object 10, the secondary transfer residual toner on the medium imprint object 10 is removed by the fur brush 92 and the cleaning blade 93, and the removed toner is conveyed to the waste toner bottle which is not illustrated [ for example, ] by the toner conveyance member 94.

[0155] Now, the particle binding object 96 is formed in the lower stream of a river of such medium imprint object cleaning equipment 17. Although the particle binding object 96 is what pushed and hardened the particle which consists of zinc stearate, a thing containing a fluororesin, etc., and was formed in the shape of a stick and carries out a graphic display abbreviation, it supports a end face with a holder etc., for example, carries out spring energization of the holder etc., and comes to press a head against the medium imprint object 10.

[0156] And a particle is adhered with the particle binding object 96 with a revolution of the medium imprint object 10, and as shown in drawing 14, the toner adhesion force reduction layer 98 which consists of the adhering particle 97 is formed in the front face of the medium imprint object 10. the toner adhesion force reduction layer 98 is uniform — it carries out to a condition, i.e., the maximum nectar restoration condition, further desirably. In addition, the sign 99 in drawing 14 shows the toner which adhered on the medium imprint object 10.

[0157] 0.1–1.0 micrometers of particle diameter are good. If particle diameter becomes large, even if it forms the toner adhesion force reduction layer 98 in homogeneity, possibility that irregularity will be made and the trap of the toner will be carried out will arise.

[0158] There is a possibility of transferring as the particle binding object 96 presses, the force is not held on medium imprint object 10 front face, or it adheres to the medium imprint object 10 and it is conveying, after it adheres superfluously as it is shown in drawing 15, when the range of 1 – 20 g/cm is the optimal and exceeds 20 g/cm, and the toner adhesion force reduction layer 98 turns into 2–3 layers and a toner 99 is imprinted. Moreover, contact of the grain child binding object 96 which is less than 1 g/cm, and the medium imprint object 10 becomes an ununiformity, the part in which the toner adhesion force reduction layer 98 is not formed will occur, and fixing of the toner to medium imprint object 10 front face will be promoted as a result.

[0159] By the way, in the example of a graphic display, the particle binding object 96 was adhered to the medium imprint object 10, and the particle 97 of direct push reliance and the particle binding object 96 was adhered to the medium imprint object 10. However, although a graphic display abbreviation is carried out, the particle which it failed to delete from the particle binding object 96 using the brush may be made to adhere to the medium imprint object 10.

[0160] The brush to the particle binding object 96 and the medium imprint object 10 eats, and when less than 0.5mm, it becomes impossible in this case, for contact nonuniformity with a brush to become remarkable, if 0.5mm – 2mm is the optimal and exceeds 2mm, respectively, and for the



amount of lumps to perform enough adhesion on scraping from the particle binding object 96 by lowering of contact pressure, and medium imprint object 10 front face.

[0161] Here, the case where zinc stearate is used is explained as a particle 97. Although dispersibility of zinc stearate with a toner is good, it has the electrification property of a toner and reverse and its adhesion force with a toner is also high. A wax ingredient can be raised as an ingredient similar to this. It is based on organic materials, such as carnauba wax and polypropylene.

[0162] That is, since the closest packing of the particle 97 is carried out on the medium imprint object 10 while heightening adhesion force with a toner 99 and ensuring maintenance of the toner 99 on the medium imprint object 10 by using zinc stearate, possibility that a toner 99 will adhere to the medium imprint object 10 directly is reduced remarkably. furthermore -- since the electrification property of zinc stearate is contrary to a toner and the adhesion force of zinc stearate and the medium imprint object 10 decreases at the same time it makes it easy to adhere a toner 99 -- the \*\* toner on the medium imprint object 10 -- cleaning equipment 17 -- enough -- scraping -- things are made.

[0163] Next, the case where the thing containing a fluororesin is used as a particle 97 is explained.

[0164] A fluororesin has a mold-release characteristic to the charge of facing of a toner 99, the medium imprint object 10, and the image support 40. It is raised as a reason that this has the low surface energy of fluorine itself to other ingredients. Moreover, since the medium imprint object 10 has the high mold-release characteristic, as for a fluororesin, it can avoid the toner to a front face, and adhesion of a member.

[0165] As a main ingredient, polytetrafluoroethylene (PTFE) and tetrafluoroethylene-perfluoroalkyl vinyl ether (PFA), a tetrafluoroethylene hexafluoropropylene polymer (FEP), polychlorotrifluoroethylene resin (PCTFE), a tetrafluoroethylene ethylene copolymer (ETFE), a chlorotrifluoroethylene ethylene copolymer (ECTFE), poly vinylidene fluoride (PVDF), polyvinyl fluoride (PVF), etc. can be raised. Since content of the combination of these ingredients or a conductive ingredient is greatly related to the volume of the medium imprint object 10, and the property of surface electrical resistance, it is good to adjust suitably.

[0166] By adoption of a fluororesin ingredient, it can be fundamentally charged in reversed polarity with a toner 99, electrostatic adhesion force with a toner 99 can be reduced, it can make it possible to scratch the transfer residual toner which exists on the medium imprint object 10 with cleaning equipment 17, and generating of the after-image in the following image can be prevented.

[0167] Now, the particle binding object 96 mentioned above can press, and the degree of strength can also be enabled.

[0168] For example, as shown in drawing 16, towards the medium imprint object 10, it has a light emitting device 110 and a photo detector 111, the light emitted from the light emitting devices 110, such as photosensor, is reflected on medium imprint object 10 front face in which the toner \*\*\*\* pattern was formed, it puts into a photo detector 111, concentration is detected, the particle binding object 96 over the medium imprint object 10 presses based on it, and strength is changed.

[0169] Detection timing considers as 5 - 10 times to die length of 29.7cm of the sheet of A4 size, and is taken as the minimum interval of about 3cm. The detection output voltage by the image pattern detected by that cause by drawing 17 is shown. By the halftone image, an output is high and the output is low by the solid image.

[0170] By the halftone image, since the rate of area of a \*\* toner is low as compared with a solid image, in the contact by the cleaning blade 93, the toner adhesion force reduction layer 98 is easy being scratched more, and it may exfoliate selectively.

[0171] Then, when the integral value integrated from the beginning is set as a certain value and the value is reached, the particle binding object 96 presses, and as the force is made to raise from 10g/cm to 15 g/cm and is shown in drawing 18 by about ten-sheet image formation to it, formation of the toner adhesion force reduction layer 98 is promoted. It presses, and it presses and it is good to be greatly dependent on the force and the process linear velocity which described time amount previously, and to optimize by the system.

[0172] By the way, it is good to rotate the medium imprint object 10 at the time of non-image formation, to contact the medium imprint object 10 in the cleaning blade 93 of cleaning equipment 17, to remove the particle adhering to a front face, to press the particle binding object 96 fixed time after that, and to form the uniform toner adhesion force reduction layer 98.

[0173] If the medium imprint object 10 is rotated at the time of non-image formation and the medium imprint object 10 is contacted in the cleaning blade 93 of cleaning equipment 17, the toner adhesion force reduction layer 98 will exfoliate in about 1 minute. That is because the toner adhesion force reduction layer 98 has only adhered simply, and if it carries out more than it, medium imprint object 10 front face will get damaged by the interaction with a cleaning blade 93, and it will become a concavo-convex configuration.

[0174] Then, if the particle binding object 96 is pressed for about 2 minutes, the uniform toner adhesion force reduction layer 98 can be formed. There was an old thing, also when a toner entered between the toner adhesion force reduction layers 98, but if it does in this way, it will become possible to remove a toner from medium imprint object 10 front face thoroughly. Thereby, cleaning of a transfer residual toner is always ensured and generating of an after-image, fixing, etc. can be prevented.

[0175] Now, it is usually known that the time constant  $\tau$  in a resistor is expressed with  $\tau = (\text{dielectric constant of resistor}) \times (\text{volume resistivity of a resistor})$ . This is a time constant in the case of the circuit where the resistance component and capacity component of a resistor were connected to juxtaposition, and a medium imprint object time constant can consider that the above-mentioned circuit is an equal circuit.

[0176] If the potential difference between  $q$  and the medium imprint body surface rear face at that time is set to  $V$  for the charge accumulated in the belt front face of a medium imprint object in the model of drawing 19 and the displacement current which flows the electrostatic capacity of a medium imprint object to  $C$  and Resistance  $R$  is set to  $I$ , when the formula of the  $q=C \cdot V$  (formula 1) (formula 2)  $I=V/R$  (formula 3)  $I=dq/dt$  above will be arranged, it is  $x(1/RC) dq/dt=1/RC$ .

When a next door and this formula are solved by time amount about  $q$ , it is  $q(t) = \exp(-t/RC)$ .

If it converts into surface potential, it will be set to  $V(t) = \exp(-t/RC) / C$ , and will be set to potential difference  $1/e$  of the first stage immediately after charging a medium imprint object at the time of  $t=RC$  from the above-mentioned relation.

[0177] Time amount until time amount, i.e., medium imprint object top-face potential, until  $V$  declines to  $1/e$  descends and the potential difference with underside potential is set to  $1/e$  of an initial state is equivalent to the time constant  $\tau$  of a medium imprint object, and serves as  $\tau=RC$ . Since it becomes  $0$  (formula 7)  $d$  (formula 8)  $R=\rho \cdot d$  of  $C=\epsilon \cdot \epsilon_0$  when  $C$  and  $R$  per unit area set  $d$  and a volume resistivity to  $\rho \cdot V$  and set [ the thickness of a medium imprint object ] the dielectric constant of  $\epsilon$  and a vacuum to  $\epsilon_0$  for specific inductive capacity, a time constant  $\tau$  serves as  $\tau=\rho \cdot (\epsilon \cdot \epsilon_0 \cdot d)$  (formula 9)  $V-\epsilon \cdot \epsilon_0$ . Therefore, it turns out that the time constant of the medium imprint object thickness direction is expressed with  $\tau=(\text{dielectric constant of medium imprint object}) \times (\text{volume resistivity of a medium imprint object})$ .

[0178] Here, suppose that the medium imprint object was charged and the front face was charged under a certain effect. As a factor in which a medium imprint object is charged, electrification by contact to conductive members, such as electrification by discharge or a roller, a plate, etc. with the frictional electrification and the corona charger with a certain components, a discharge brush, etc. which constitute a machine, etc. is mentioned. For example, the case where a toner is charged before a secondary imprint, mention  $Q/M$  of a toner, and imprint effectiveness is improved, and the case where it is made easy to electrify a secondary transfer residual toner with a corona charger or a conductive roller before medium imprint object cleaning, to arrange a polarity, and to clean are applied to this example. In addition, the phenomenon in which that the medium imprint object has coiled around a conductive roller also causes frictional electrification, and a charge takes a front face etc. is observed, and this charge may have caused the poor imprint.



[0179] Thus, electrification of the front face of a medium imprint object poses a big problem at migration of a toner image in the case. Although a toner moves in an operation of electric field, the potential difference with the element tube of a medium imprint object rear face and an opposed face, for example, image support, or rodding of a secondary imprint roller determines the field strength, but the effect is large when the medium imprint body surface is charged. Moreover, if the medium imprint body surface crossed to the whole surface and is charged in homogeneity, better, electrification nonuniformity has arisen in many cases and a medium imprint body surface will become imprint nonuniformity in a partial part in that case actually. Therefore, when between after a medium imprint body surface is charged until it goes into the stroke of the migration of a toner to a degree is set to  $T_0$ , there is little effect which medium imprint object top-face potential will fully decrease if it is  $T_0 < \tau$ , and it has on migration of a toner. Since  $T_0$  is expressed as  $L_0/VL$  when a medium imprint object sets passing speed of  $L_0$  and a medium imprint body surface to  $VL$  for the die length of the front face on a medium imprint object after a front face is charged under a certain effect until it starts migration of the following toner, it becomes  $L(\text{formula } 10) \cdot 0 - /VL < \rho V - \epsilon - \epsilon_0$ .

[0180] Here, if the volume resistivity of a medium imprint object, specific inductive capacity, passing speed, and distance are set up as [ according to claim 27 ] this invention so that a formula 10 may be filled, turbulence of the toner image at the time of the imprint by electrification of a medium imprint body surface can be prevented. If the distance between image support in the tandem medium imprint method in the case of repeating a primary imprint and performing it a passage according to claim 28 similarly hereafter is set up, turbulence of the toner image at the time of the imprint by electrification of a medium imprint body surface can be prevented. Similarly, if the distance from the last primary imprint location to a secondary imprint location is set up a passage according to claim 29, turbulence of the toner image at the time of the imprint by electrification of a medium imprint body surface can be prevented. Similarly, if the distance from a secondary imprint location to the cleaning location of a medium imprint object is set up a passage according to claim 30, turbulence of the toner image at the time of the imprint by electrification of a medium imprint body surface can be prevented. If similarly the distance to the primary imprint location of the first amorous glance is set up by claim 31 in order to perform a color pile on a medium imprint object again from the cleaning location of a medium imprint object, turbulence of the toner image at the time of the imprint by electrification of a belt front face can be prevented.

[0181] Here, based on the operation gestalt of drawing 4, the trial calculation of the property for which a medium imprint object is asked is made. Although four image support is in contact with the medium imprint object in drawing 4, it is [ all the distance between four image support in this case ] equal, and there is  $L_1 = 120\text{mm}$ . Moreover, the distance from the contact section of the last image support and a medium imprint object to a secondary imprint location is  $L_2 = 190\text{mm}$ , and  $L_3 = 245\text{mm}$  and the cleaning section to the contact section with the first image support of the distance from a secondary imprint location to the cleaning section is  $L_4 = 95\text{mm}$ .

[0182] Among the above-mentioned conditions, like the publication to claim 27,  $L$  of the shortest one is the distance  $L_4$  from the cleaning section to the first image support, and if  $L(\text{formula } 11) \cdot 4 - /VL > \rho V - \epsilon - \epsilon_0$  is satisfied, the good image should be obtained.

[0183] About drawing 4, the seamless belt which consists of a fluorine system resin sheet (specific inductive capacity  $\epsilon = 8$ , thickness  $= 150\text{micrometer}$ , and circumference  $= 1060\text{mm}$ ) was used as a medium imprint object. When that from which resistance differs this medium imprint object was prepared and volume-resistivity  $\rho V$  and surface resistivity  $\rho S$  of a medium imprint object were measured with the Mitsubishi Chemical measuring instrument (trade name: Huy Lester, probe:HRS), one medium imprint objects A were volume-resistivity  $\rho V = 1 \times 10^{11}$  to  $5 \times 10^{11}$ -ohmcm, and surface resistivity  $\rho S = 1 \times 10^9$ - $1 \times 10^{10}$ ohm/\*\* (applied voltage: 500V, timer:10 seconds). Moreover, the medium imprint objects B of another side were volume-resistivity  $\rho V = 5 \times 10^{12}$  to  $1 \times 10^{13}$ -ohmcm, and surface resistivity  $\rho S = 5 \times 10^{10}$ - $1 \times 10^{11}$ ohm/\*\* (applied voltage: 500V, timer:10 seconds). When it is made for the linear velocity of a medium imprint object to serve as  $VL = 360 \text{ mm/sec}$  and the working speed of a machine printed the image, it was a comparatively good image with the medium imprint object A, but with the medium imprint object B,



be attained, color mixture not being afraid and carrying out [ suppose that a monochrome imaging means to arrange in the revolution conveyance direction maximum upstream location of a medium imprint object is equipped with toner recycle equipment, and ] the recycle activity of the toner.

[0195] According to invention concerning claim 4, for a black monochrome imaging means at least, the effect of the invention concerning above-mentioned claim 1 can be attained among two or more monochrome imaging means, enabling the recycle activity of black with little image degradation, since it has toner recycle equipment preventing mixing of the foreign matter to a recycle toner, and preventing deterioration of image quality.

[0196] According to invention concerning claim 5, in the tandem imaging equipment of color picture formation equipment, the effect of the invention concerning above-mentioned claim 1 can be attained, making it there be no toner degradation as much as possible, since a black monochrome imaging means is arranged in the revolution conveyance direction lowest style location of a medium imprint object, even if it carries out color mixture.

[0197] According to invention concerning claim 6, in 2 color image formation equipment, the effect of the invention concerning above-mentioned claim 1 can be attained.

[0198] According to invention concerning claim 7, in the image formation equipment of the type whose image support is a drum and whose medium imprint object is a belt, the effect of the invention concerning above-mentioned claim 1 can be attained.

[0199] According to invention concerning claim 8, the effect of the invention which requires both image support and a medium imprint object for above-mentioned claim 1 in the image formation equipment of the type which is a belt can be attained.

[0200] According to invention concerning claim 9, in the image formation equipment which forms a synthetic toner image, image support is prepared at least, and the effect of the invention concerning above-mentioned claim 1 can be attained, improving maintenance nature, since the process cartridge collectively detached and attached to the body of image formation equipment is constituted.

[0201] In the monochrome imaging means of the image formation equipment which forms a synthetic toner image according to invention concerning claim 10 It has toner recycle equipment which conveys to a developer the toner collected with image support cleaning equipment. Since put more than one in order in accordance with a medium imprint object, tandem imaging equipment is constituted, a synthetic toner image is formed on a medium imprint object with the tandem imaging equipment, the synthetic toner image is imprinted and an image is formed on imprint material, the same effectiveness as invention concerning above-mentioned claim 1 can be attained.

[0202] In the image formation equipment which forms a synthetic toner image according to invention concerning claim 11 In accordance with a medium imprint object, put two or more monochrome imaging means in order, and tandem imaging equipment is constituted. It considers as the configuration which forms a synthetic toner image on a medium imprint object with the tandem imaging equipment, imprints the synthetic toner image and forms an image on imprint material. A monochrome imaging means is equipped with toner recycle equipment, and since the toner collected with image support cleaning equipment is conveyed to a developer, the same effectiveness as invention concerning above-mentioned claim 1 can be attained.

[0203] According to invention concerning claim 12, in monochrome image formation equipment, since a monochrome imaging means to constitute a developer and image support cleaning equipment in preparation for the surroundings of image support is equipped with the toner recycle equipment which conveys to a developer the toner collected with image support cleaning equipment, the recycle activity of a toner can be enabled.

[0204] The toner image on image support is once imprinted on a medium imprint object. Moreover, after, Since the toner image on the medium imprint object is imprinted to imprint material (i.e., since it imprints through a medium imprint object and an image is formed on imprint material), it is made for imprint material not to contact image support directly. Foreign matters, such as paper powder, waste, etc. adhering to the imprint material, can prevent mixing to a recycle toner, and can prevent deterioration of image quality.

[0205] In addition, it depends for the rate of an imprint on resistance greatly. Generally imprint material has high hygroscopicity and its resistance fluctuation to environmental variations, such as temperature and humidity, is large. On the other hand, a medium imprint object mainly has resistance fluctuation of as opposed to [ using the big thing of resistance in many cases ] an environmental variation smaller than imprint material, such as a resin ingredient. Then, if an indirect imprint is carried out through a medium imprint object and an image is formed on imprint material like invention concerning claim 10, resistance fluctuation to an environmental variation can be lessened compared with the direct imprint method directly imprinted to imprint material, and the rate of an imprint can be stabilized.

[0206] According to invention concerning claim 13, in the image formation equipment of the type whose image support is a drum and whose medium imprint object is a belt or a drum, the effect of the invention concerning such a claim 12 can be attained.

[0207] According to invention concerning claim 14, in the image formation equipment of the type whose image support is a belt and whose medium imprint object is a belt or a drum, the effect of the invention concerning above-mentioned claim 12 can be attained.

[0208] According to invention concerning claim 15, in monochrome image formation equipment, image support is prepared at least, and the effect of the invention concerning above-mentioned claim 12 can be attained, improving maintenance nature, since the process cartridge collectively detached and attached to the body of image formation equipment is constituted.

[0209] According to invention concerning claim 16, in the monochrome imaging means of monochrome image formation equipment, since it has toner recycle equipment which conveys to a developer the toner collected with image support cleaning equipment while imprinting the toner image on image support to imprint material through a medium imprint object, the same effectiveness as invention concerning above-mentioned claim 12 can be attained.

[0210] The toner image on image support once imprints on a medium imprint object, according to invention concerning claim 17, a monochrome imaging means equips with toner recycle equipment in monochrome image-formation equipment by considering as the configuration which imprints the toner image on the medium imprint object to imprint material the back, and since the toner which collected with image support cleaning equipment conveys to a developer, the same effectiveness as invention concerning above-mentioned claim 12 can attain.

[0211] According to invention concerning claim 18, in image formation equipment, since development bias voltage is impressed to a developer and mutual electric field are formed at the time of development, in addition to the effect of the invention concerning above-mentioned claims 1 or 12, the oscillating bias voltage which superimposed alternating voltage on direct current voltage can be impressed, it can prevent the impurity of being un-charged or low electrification adhering to image support, and deterioration of much more image quality can be prevented.

[0212] According to invention concerning claim 19, in image formation equipment, since the toner containing a release agent is used, in addition to the effect of the invention concerning above-mentioned claims 1 or 12, grinding of the toner by friction can be prevented and deterioration of much more image quality can be prevented.

[0213] According to invention concerning claim 20, in image formation equipment, since circularity uses 90 or more toners, in addition to the effect of the invention concerning above-mentioned claims 1 or 12, the shape of surface type of a toner is smoothed, the rate of an imprint of a toner is improved, the amount of recycle toners can be reduced, degradation of image quality can be prevented, and deterioration of much more image quality can be prevented.

[0214] Since the toner whose half-value width is below 2.2 [fC / 10 micrometers] is used in the distribution curve of (amount of electrifications of toner)/(toner particle size) in image formation equipment according to invention concerning claim 21 In addition to the effect of the invention concerning above-mentioned claims 1 or 12, a distribution curve can be maintained to Sharp, fluctuation of the component ratio of the toner at the time of toner recycle can be lost, degradation of image quality can be prevented, and deterioration of image quality can be prevented further.

[0215] According to invention concerning claim 22, in image formation equipment, since an elastic

layer is prepared in a medium imprint object, in addition to the effect of the invention concerning above-mentioned claims 1 or 12, a medium imprint object can be stuck to image support, the rate of an imprint of a toner can be improved, and deterioration of much more image quality can be prevented.

[0216] The effect of the invention concerning above-mentioned claims 1 or 12 can be attained preventing an after-image and generating of toner fixing without according to invention concerning claim 23, a toner's not adhering directly, but improving the cleaning engine performance, and causing degradation of a medium imprint body surface, since the toner adhesion force reduction layer which reduces the adhesion force of a toner on a front face is formed in homogeneity in a medium imprint object.

[0217] While making it easy to adhere with a toner with the zinc stearate charged in reversed polarity since a toner adhesion force reduction layer is formed using zinc stearate according to invention concerning claim 24 It is made for a toner not to adhere to a direct medium imprint body surface, and the effect of the invention concerning above-mentioned claims 1 or 12 can be attained, preventing an after-image and generating of toner fixing by reducing the toner adhesion force to a medium imprint object, and improving the cleaning engine performance.

[0218] According to invention concerning claim 25, the effect of the invention concerning above-mentioned claims 1 or 12 can be attained, preventing an after-image and generating of toner fixing by raising the mold-release characteristic between a medium imprint body surface and a toner, and improving the cleaning engine performance, since a toner adhesion force reduction layer is formed using a fluororesin.

[0219] The effect of the invention start to above-mentioned claims 1 or 12 can attain preventing an after-image and generating of toner fixing simply without according to invention concerning claim 26, inviting degradation of a medium imprint body surface, using improvement in the cleaning engine performance as easy, since the particle which uses a brush and it failed to delete from a particle binding object is adhered to a medium imprint object and a toner adhesion force reduction layer is formed by the adhering particle.

[0220] Even if there is [ according to invention concerning claim 27 ] a case so that the front face of a medium imprint object may be charged under a certain effect in addition to the effect of the invention concerning above-mentioned claims 1 or 12 After that A primary imprint, a secondary imprint, cleaning of a medium imprint object top toner, etc., By the time it reaches the process course which the toner on a medium imprint object moves, the charge on a medium imprint object will be eased, and a good image can be offered, without needing special equipment so that migration of a toner may not be barred.

[0221] According to invention concerning claim 28, it adds to the effect of the invention concerning above-mentioned claims 1 or 12. While a medium imprint object moves to the primary imprint location of a degree from a primary imprint location, the charge which moved to the medium imprint body surface by decreasing to below  $1/e$  When it is fully canceled and the potential hysteresis on a medium imprint object imprints a toner image in piles on a medium imprint object, a good image can be offered without needing special equipment so that an image may not be confused or imprint effectiveness may not fall.

[0222] While a medium imprint object moves [ according to invention concerning claim 29 ] from the last primary imprint location which performs a color pile to a secondary imprint location in addition to the effect of the invention concerning above-mentioned claims 1 or 12, the charge which moved to the medium imprint body surface declines to below  $1/e$ . An image is not confused or imprint effectiveness seems therefore, not to fall, when it is fully canceled and the potential hysteresis on a medium imprint object imprints a toner image from on a medium imprint object to imprint material.

[0223] According to invention concerning claim 30, it adds to the effect of the invention concerning above-mentioned claims 1 or 12. While a medium imprint object moves from a secondary imprint location to a medium imprint object cleaning location, the charge produced in the medium imprint body surface by decreasing to below  $1/e$  The potential hysteresis on a medium imprint object is fully canceled, the charge of the residual toner which remained on the medium

imprint object on the occasion of the toner image imprint to imprint material fully falls, and the effectiveness of medium imprint object cleaning seems not to fall.

[0224] While a medium imprint object moves [ according to invention concerning claim 31 ] to a primary imprint location from a medium imprint object cleaning location in addition to the effect of the invention concerning above-mentioned claims 1 or 12, the charge which moved to the medium imprint body surface declines to below  $1/e$ . Electric field seem therefore, not to disturb transition of a toner image, in case it is fully canceled and the potential hysteresis on a medium imprint object imprints a toner image from on image support to up to a medium imprint object.

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[Translation done.]

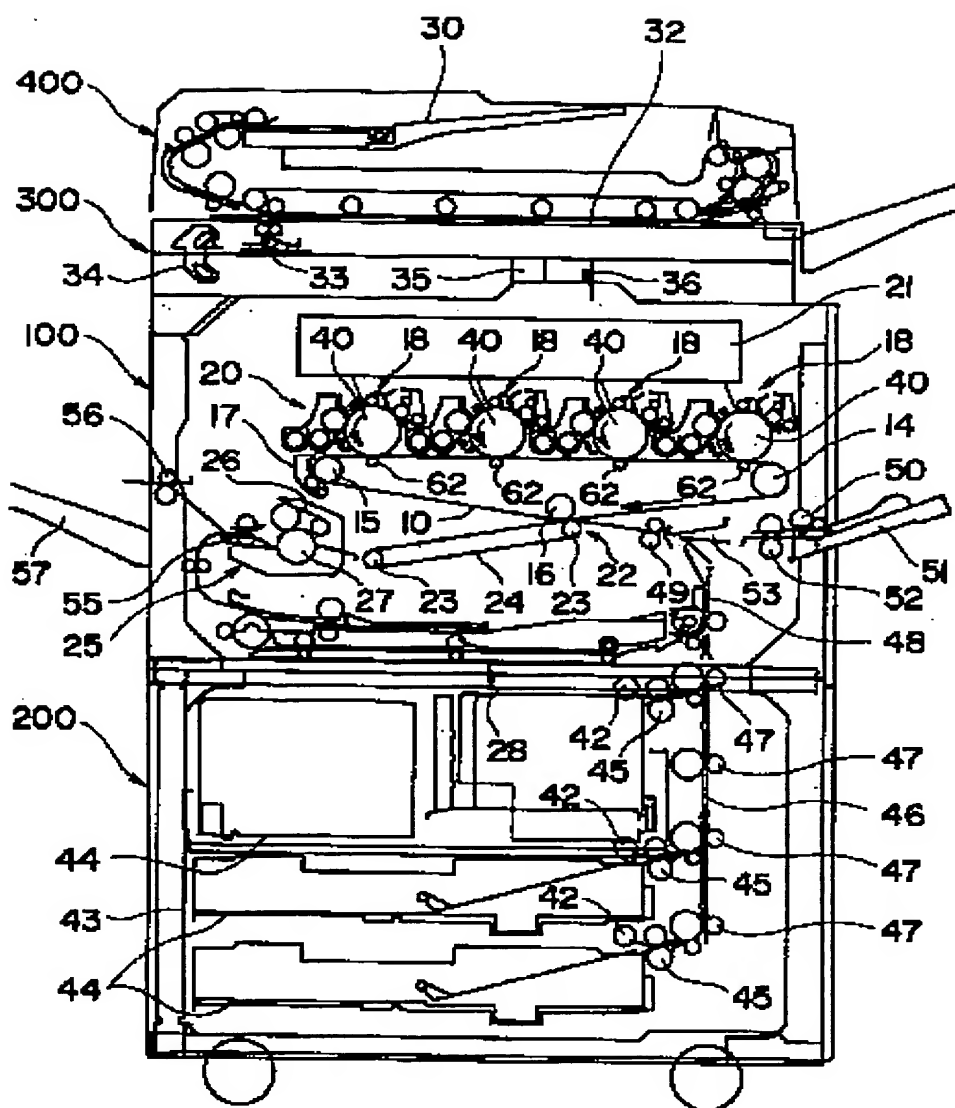


Fig. 1

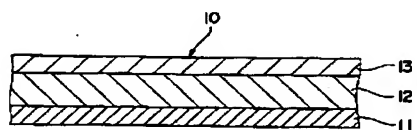
Drawing selection 

Fig. 2

[Translation done.]



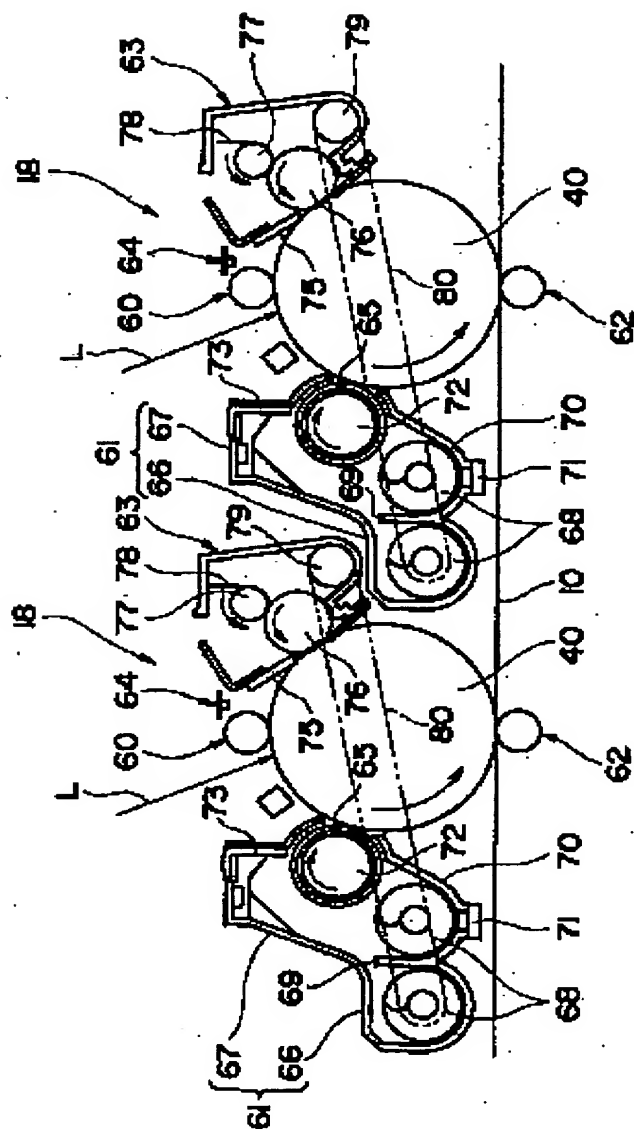


Fig. 3

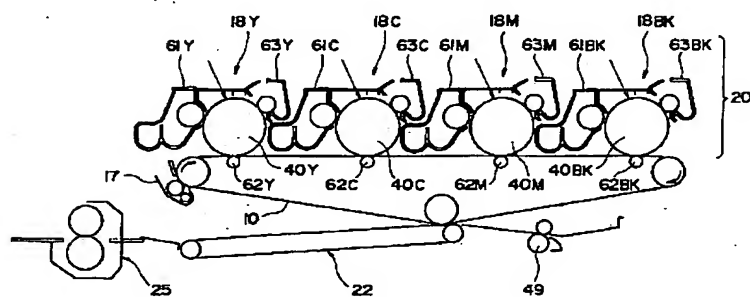
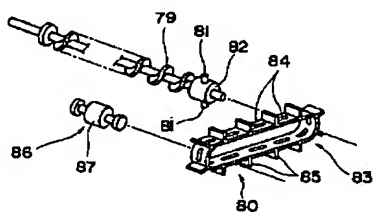
Drawing selection 

Fig. 4

[Translation done.]

Drawing selection

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[Translation done.]

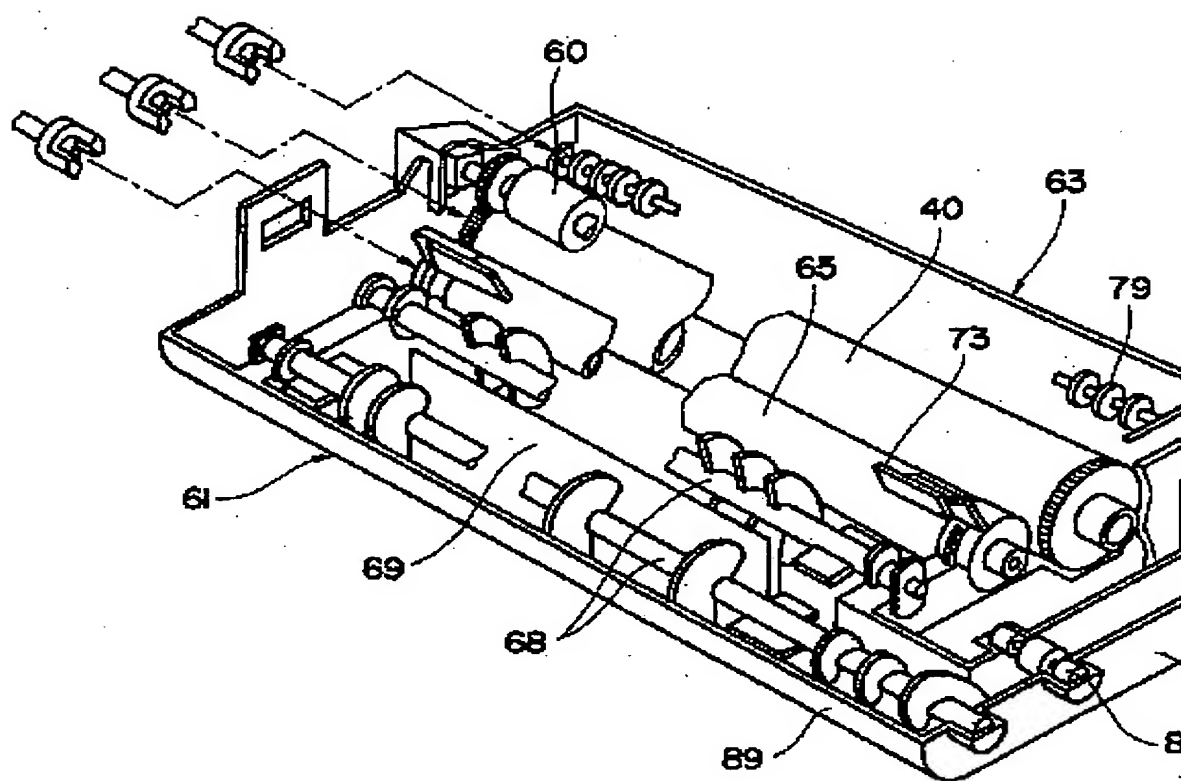


Fig. 6

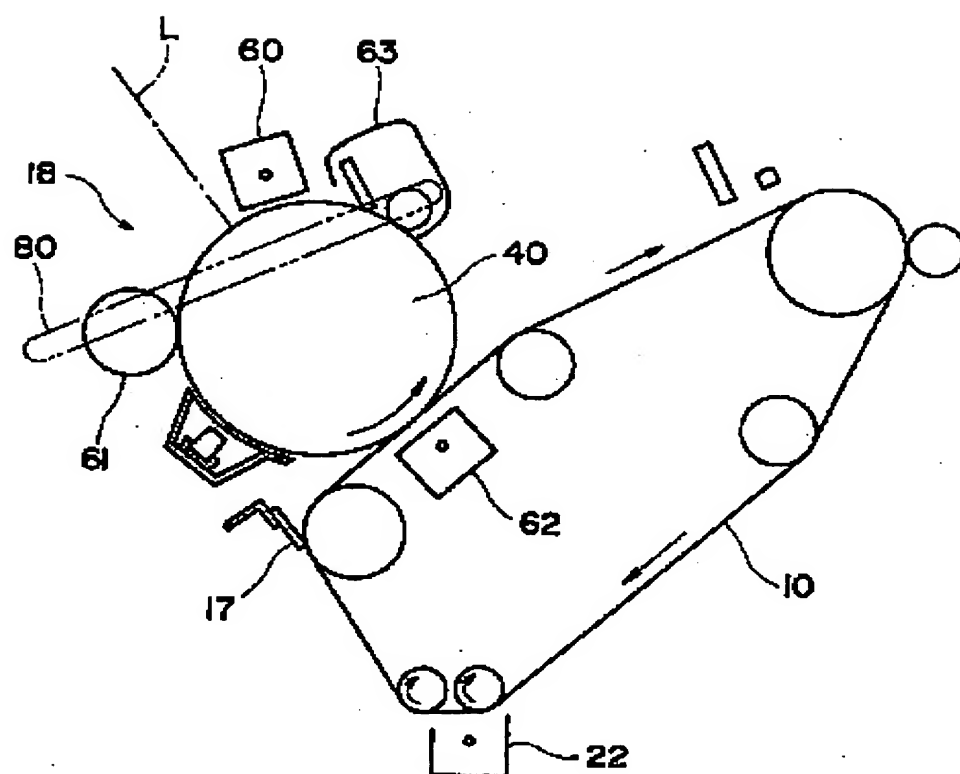


Fig. 7

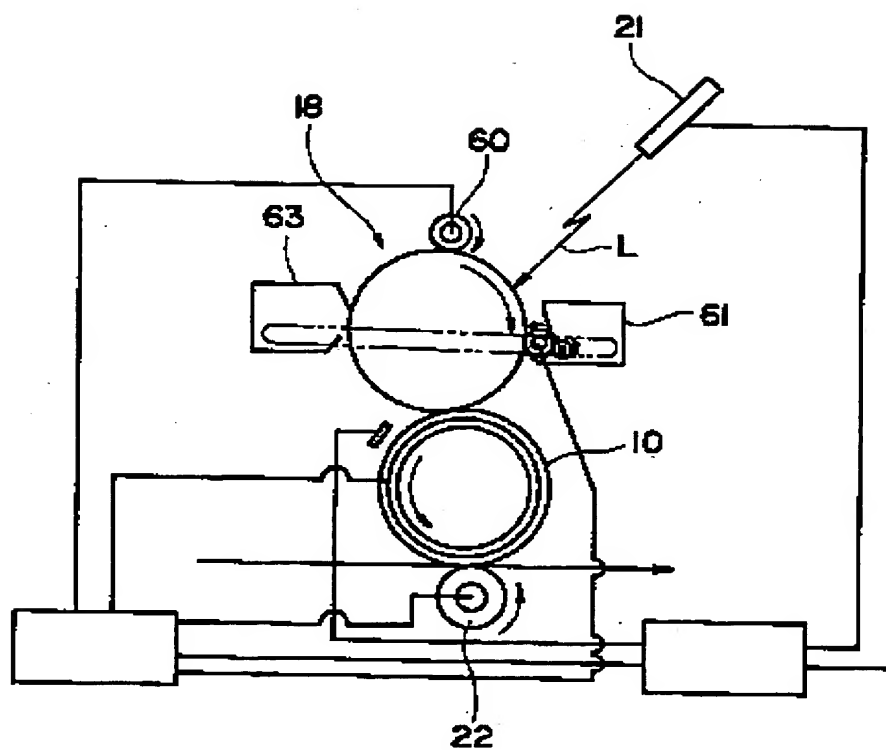
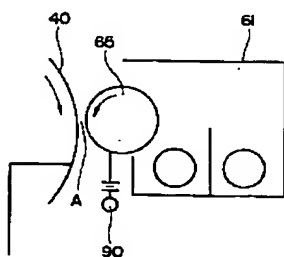


Fig. 8

Drawing selection

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[Translation done.]

distribution

q/d分布

初期とリサイクル後の比較

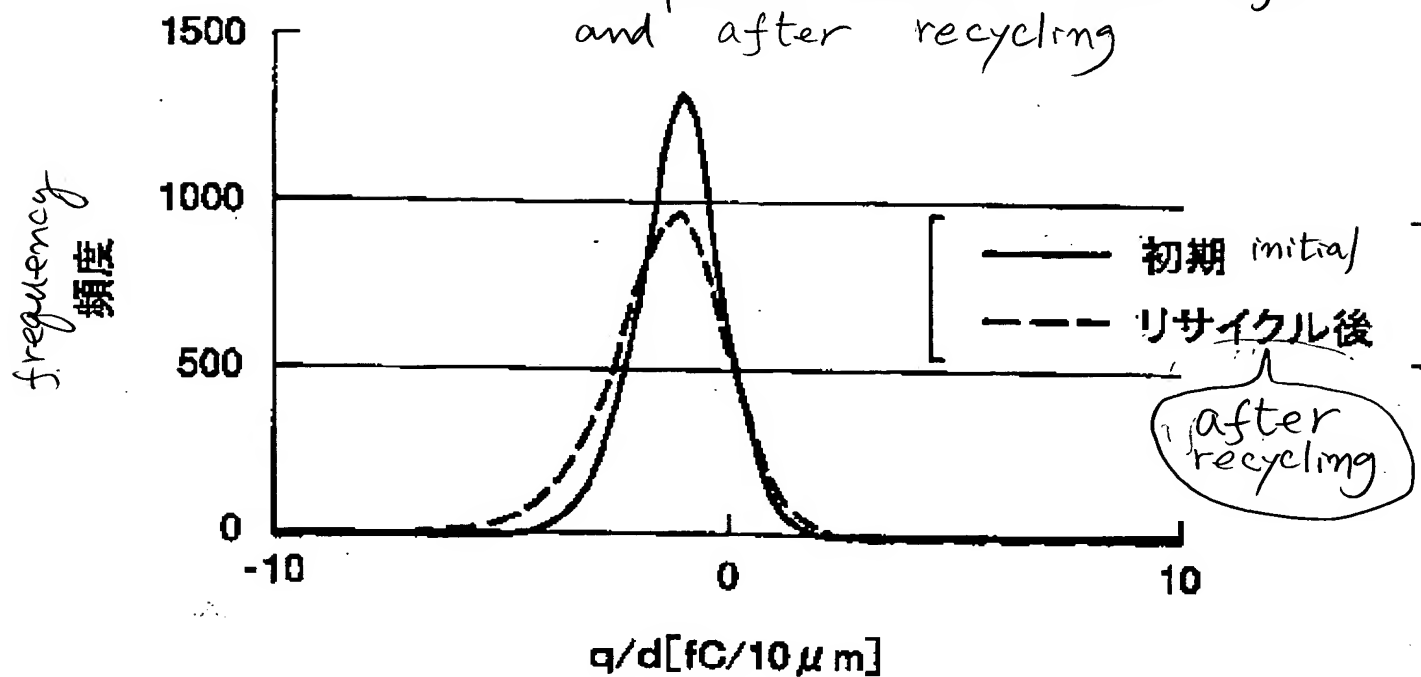
comparison between initial stage  
and after recycling

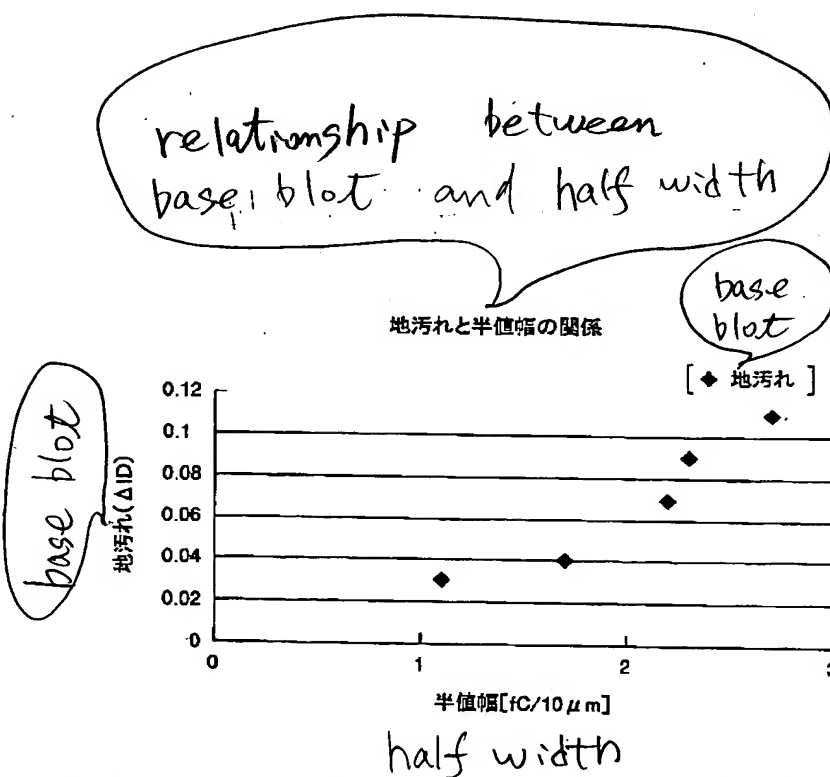
Fig. 10



DOCUMENT 1/1  
DOCUMENT NUMBER  
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1. JP,2002-174934,A

Drawing selection drawing 11



[Translation done.]

BACK

NEXT

MENU

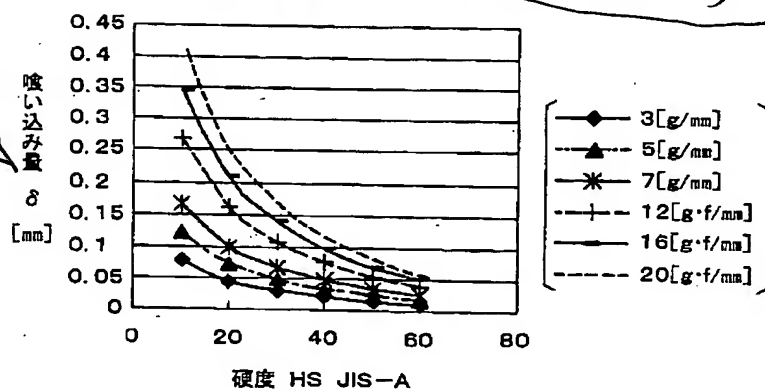
SEARCH

HELP

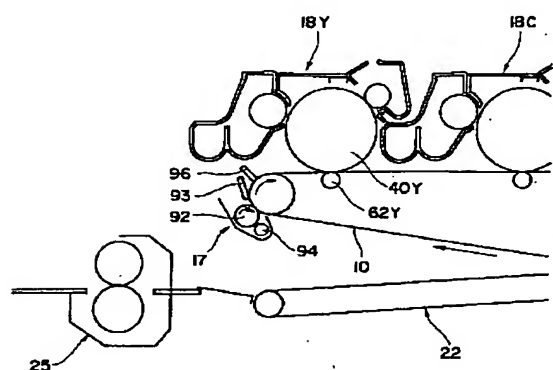
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喰い込み量 Vs. ロール硬度

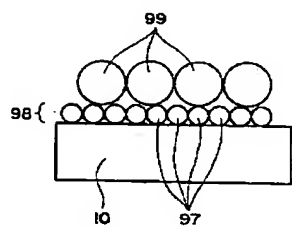
level of ingrowing Vs. roller hardness



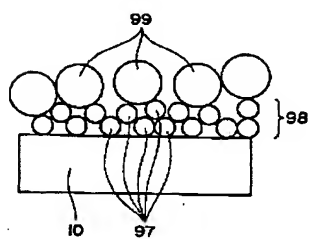
[Translation done.]

Drawing selection 

[Translation done.]

Drawing selection 

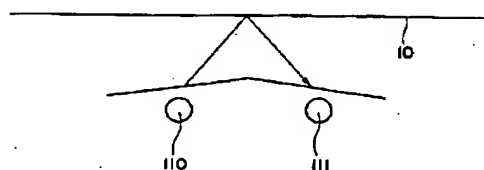
[Translation done.]

Drawing selection 

[Translation done.]

Drawing selection drawing 16

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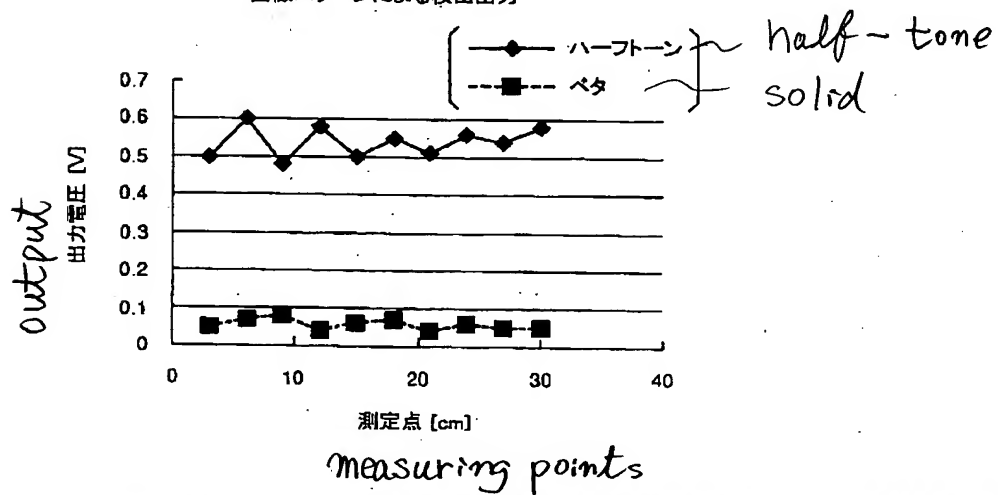
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[Translation done.]

Drawing selection 

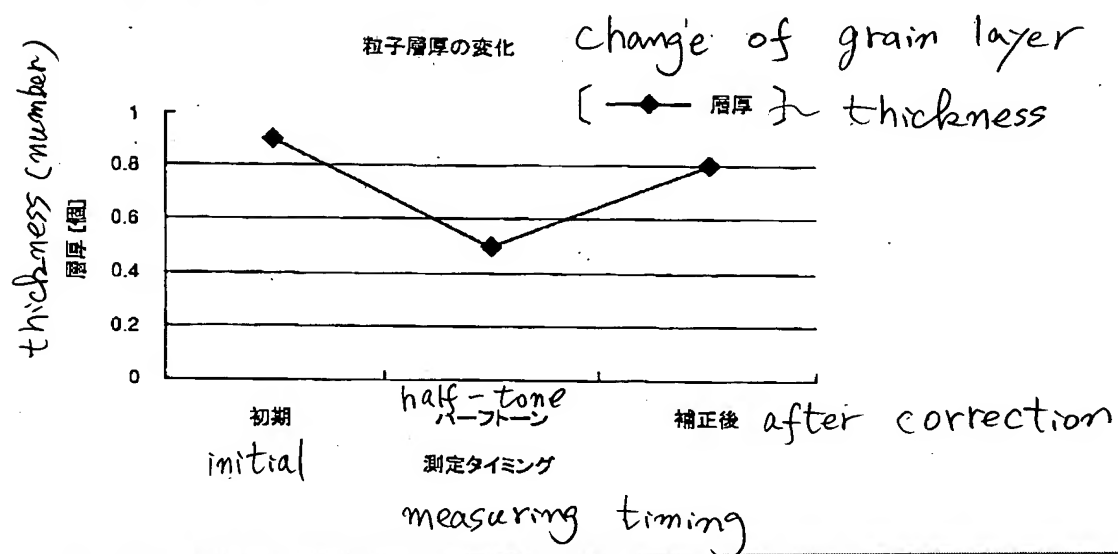
# Detection Output and Image patterns.

画像パターンによる検出出力

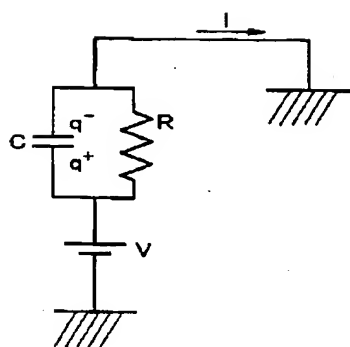


[Translation done.]



Drawing selection 

[Translation done.]

Drawing selection 

[Translation done.]